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Editorial Notes.

Consolidation of the Industry's Technical Ability.

MEMBERSHIP of The Institution of Gas Engineers is going to be more than ever something worth having. It is to be more comprehensive, higher in standard, and the new spirit more catholic than in the past. The archaic notion that the engineer who is in charge of a gas-works, and is responsible for making gas, is alone entitled to the designation "gas engineer," while the engineer who designs and constructs plant for the making, storage, and distribution of the gas is not a "gas engineer," has been finally extinguished by what was done at the special meeting of the Institution on Monday last week. We commented in our last issue upon the new era for the Institution which, by a unanimous vote, was then inaugurated; and now a brief further reference to the changes that wisdom is effecting in inviting, subject to certain qualifications, all technical talent that is exercised in the interests of the industry to come into the ranks, and to participate in conference and work.

We need not dilate on this occasion upon what is universally recognized, and has been so frequently the subject of comment in these columns, that the co-operation and collaboration of the technically trained brains and minds in the gas making and supplying part of the industry and of those in the part devoted to plant design, building, and contracting, are essential in these days of new conditions and competitive activity with the primary and secondary products of the industry. It is on the sale of those products that every part of the industry lives; and from that fundamental truth there can be no departure. Hence the need for the technical ability of the industry being consolidated and brought to bear upon the one main objective. It will be seen from this that what is being done in this respect is not inspired by any selfishness on the part of those who are to-day the moving spirits in the Institution, and who, situated and operating in new circumstances, see things differently from their predecessors. Consolidation of interests, through amalgamations or otherwise, for technical and commercial advancement is the order of the day in most of our long-established industries; and it gives power. For example, this introduction of the technical minds of the constructional and contracting part of our industry into collaboration in the work of the central technical organization will be of advantage not only in respect of the internal affairs of the industry, but it is easy to see that it links-up, through the representative men of the plant-manufacturing part, the producers of gas, coke, and so forth with the great industries from which the latter draw their supplies, and with which they do business. And so from a common centre influence spreads. In every way mutual advantage is to be gained by what is now being done. It still holds goods that "unity is strength"—and "strength" in this case means power for all concerned.

Opportuneness and advantage were, at the special meeting, emphasized by the President (Mr. H. D. Madden, M.Inst.C.E.), by Mr. H. C. Smith, and his "fellow conspirator" in this matter, Mr. F. C. Briggs. To the two latter belongs the honour of reviving the question of membership expansion and elevation at a time when it was ripe and convenient—when the Institution was desirous of obtaining a Charter, and when the two matters could be dealt with simultaneously with that other long-delayed but necessary reformation, the making of membership subject to training and examination so as to ensure that henceforward membership of the Institution might really mean technical qualification. This had to be done at some time. The reigning President and Council, who possessed the statesmanship and courage to frame and submit this tripartite scheme—Charter, membership enlargement, and the examination qualification for juniors—have earned for themselves the highest regard of the gas engineers of the future, whose technical status will be assured, and will not be the amorphous thing that it has been in the past, when some are, others are not, what they profess to be. The whole gamut of the industry's operations—the manufacture and distribution of town's gas, the design and construction of plant and apparatus, the manufacturing and working-up of secondary products, the research into each and all of these activities—will provide the area of suitable qualification for membership, and none will be admitted in the future who have not the necessary credentials. The new road to the Institution entrance is broad, but it is carefully paved, bounded, and guarded, as the elucidating speeches of the President, Mr. Smith, and Mr. Briggs showed. There will be moderate increases in subscriptions; but who will complain when status, scope, capacity, and value of the Institution have been placed on the upward road?

Notable Carbonizing Data from Oldbury.

IT was a remarkable paper that Mr. Joseph Poulson, Engineer and General Manager of the Oldbury Gas Department, submitted at the meeting of the Midland Association, as reported in the "JOURNAL" last week. It was remarkable in that it dealt with a long series of tests carried out with all the measuring implements of a test plant, and yet with the work going on in other respects normally, and for daily commercial ends. Everything was measured—coal, temperatures, gases, secondary products, steam, fuel, producer gases—in fact, nothing was left undone which should be done to ensure accuracy. Several kinds of coal were used singly and in stated mixtures; and the mass of data given for each in tabulated form will cause this contribution to stand out conspicuously from the literature treating of continuous vertical retort operation. The results set some of the members wondering, as in some cases they leave well behind the expected and usual in many an undertaking in which continuous vertical retorts are employed, and very similar coals carbonized. But there it is; and Mr. Poulson has done his best to disarm criticism by the fullness of the information imparted. That very fullness is an invitation

to critical examination to see where, if any, weaknesses exist or errors have been inadvertently made. The author may rest assured that those who are not doing so well as he, in respect of gaseous therms and the other products, will scrutinize every item with care; and we rather imagine there will be many attempted constructions of thermal balance-sheets, as it looks as though the overall thermal efficiency with some of the coals *plus* steam runs to a percentage figure which, so far as memory serves, takes a leading place. But the tests are so guarded and fortified by thoroughness, by measuring equipment and analysis, by the duration of the tests, and by the quantities of coal dealt with, that there will be a natural hesitation to criticize, lest in the end Mr. Poulson scores, and the critic only meets with mortification.

The tests were carried out on a Glover-West vertical retort plant; and the coals used were North Staffordshire, Derbyshire, and Yorkshire, and mixtures, in definitely known proportions, of these coals with North Wales slack. Most of the coals were high in volatile matter and low in ash; and probably this accounts for certain of the results which are looked upon as notable, or, perhaps it would be more correct to say, extraordinary. The tests are of such range that they require nearly all the letters of the alphabet to denominate them—at any rate, they run from A to S. One conclusion that Mr. Poulson is enabled to draw from his experiences is that they confirm those who deny that continuous vertical retorts necessitate selected coals. The fact is that the retorts themselves bring out the differences in coals which would be practically obscured in any intermittent system, and the working of the retorts is adjustable to the coals. This is an important consideration in coal purchasing, as is also the elasticity of the system in operating to requirements in respect of the calorific value of the primary product. In examining the detailed figures of each test, it will be well first to read the remarks of the author which appear under the cross heading "Description of Carbonizing Tests." Looking at the tables, it will be seen that the makes per ton range from 75·66 therms for North Staffordshire No. 1 washed beans (A), to 116·64 therms for Derbyshire washed doubles (H). This latter result Mr. Poulson admits was a surprise to him; and, in replying to the discussion, he remarked that it is highly probable the reactivity of the coke was in large measure responsible for it. There are other results above 100 therms and a little below; but a fair representation is the 91·11 therms in the S test, which covered the longest period, during which no less than 2171·6 tons of coal were carbonized. This was a mixture, made as evenly and thoroughly as possible, of six varieties of coal—45 p.ct. Staffordshire, 28 p.ct. Yorkshire, 9 p.ct. Derbyshire, and 18 p.ct. North Wales nutty slack. Though H is the best in regard to therms per ton, it is not the superior one so far as gas make per retort per day goes. Test F, with Derbyshire washed gas nuts, takes the lead in this respect —480 therms per retort, with a make per ton of 102·36 therms. The gas production per retort per day of H is 410·6 therms, and of S 382. The percentage of steam by weight of coal carbonized in the case of F was 26·88; in the case of H 33·36; and in that of S 26·87—the range through the whole series of tests being 25·81 p.ct. to 35·74 p.ct. This is heavy steaming, and Mr. Poulson admitted that his liquor was only of 6 to 7 oz. strength, which means there must be much liquor to handle. On the other hand, the calculated production of sulphate of ammonia is good—running from 25·77 lbs. per ton of coal to 33·43 lbs., which is partly attributable to the heavy steaming. Though there is this heavy steaming, the coke and breeze made varies from 10·46 cwt. per ton to 12·77 cwt. The dry tar results are also extraordinarily good—varying between 15·8 and 18·6 gallons per ton of coal carbonized.

Small wonder that such figures as are disclosed in the paper forcibly struck the members. There was an obvious reluctance to discuss them freely without full investigation; and in the remarks of one or two speakers we fancy we detect a little suspicion as to whether the measuring instruments were all as reliable or correct as they should be. However, nothing was said which in any way upsets the data; but we shall be surprised if the last has been heard of them. In considering the figures, we think the steaming chart will carry conviction that the results obtained may be expected when an engineer gives his whole attention to a comparatively small plant, when using "washed doubles," "washed beans," or clean nuts (which is the very best condition, physically, for coal to be treated in continuous vertical retorts), and when he has sufficient time to tune-up the plant to the requirements of each particular coal or combination of coals. The results prove beyond a doubt that the continuous vertical retort is able to give the very best return from the selected coal. In the intermittent systems, any and every coal must be put through substantially the same treatment; but we think it will be admitted that it is impossible with the latter systems to adjust the carbonizing conditions to the same large extent to the requirements of the coal. With a continuous retort it is possible (as already said) to adjust the plant to the coal; and, provided the class of coal or the combination of coals remains constant, the plant can be regulated to get the maximum yield from the coal or combination of coals. Many examples could be given of cases where it is found distinctly profitable to purchase screened coals or washed nuts at a higher price rather than slacks at a low price. This does not mean that slacks cannot be handled in continuous verticals, or that it is necessary to select coal for verticals. It means that a very much higher yield per ton and per retort can be obtained with good clean coals. There is, therefore, nothing surprising in Mr. Poulson's results. They have been obtained before, and can be realized again in similar circumstances, with similar coals, and with the constant attention of a capable technical staff; but there must be warning that the same results are not to be secured under other conditions.

Will the Coal Industry Benefit?

The appeals of Mr. A. W. Archer and others who are prominent in the Five Counties Coal-Selling Scheme, and of those who take the lead in activity in connection with the South Wales Coal-Marketing Scheme, show not that there will be a want of loyalty so long as the coalowners remain members, but that there is a large amount of doubt within the membership of both organizations as to whether the plans are going to succeed in their object. So long as that continues there is danger to cohesion. In both areas there are also coalowners who have preferred to remain outside and free. Mr. Archer has boasted of the size of the Five Counties Association, has referred to it as the most imposing factor in the European coal situation, and has indicated that the Association are going to arm themselves to the teeth with funds drawn from the home consumers of coal—public utility undertakings making greatest contribution—and to fight for the markets overseas if the Polish and German coalowners do not desist from occupying certain of them. In other words, those markets are to be regained by a price-cutting war, unless common sense prevails, and the owners of Poland and Germany "cave-in" to "the biggest factor in the European coal situation," and come to terms. Poland is out for the retention of the markets its coalowners have secured, and at the moment it evinces no intention of being bullied into giving them up. Naturally we want to see the British coal industry re-established on an economic basis; but whether these coal-selling schemes, reduction of production, and subsidizing export coal from the pockets of home consumers are the correct means to that end is open to question. The coalowners in other areas at home have been examining the situation to see how they will fare. The Durham, Northumberland, and Scottish owners foresee that undercutting of the Humber exports will probably do more to injure the northern export trade than that of Poland and Germany. The Managing Director of the Ashington Collieries (Mr. Ridley Warham), writing in the "Ashington Collieries Magazine" on the subject of the Yorkshire, Lancashire, and Midlands scheme, says: "They talk of getting their "old trade back from Poland; but obviously they will "swallow up the steam coal export trade of the Forth and "North-East ports before they touch the Polish trade. "We think their scheme will be a failure, and a very "costly failure, but we fear that a considerable part of "the cost may fall upon us. . . . We think we can go

"on without much difficulty so long as we have to meet "only ordinary economic competition. But if the Mid- "lands, as well as Poland, are going to dump their coal "in our foreign markets at shillings below cost, it is "obvious that our trade will quickly disappear." That apparently represents the view of Durham and Northumberland generally. Another serious aspect of what is being done is that it is calculated that in Scotland some 20 p.ct. of the men who have been on the colliery pay-sheets since the coal stoppage will, through the reduction of production, be thrown out of work to swell the army of unemployed. The Five Counties scheme is also deposing more men from employment. Of course, it cannot be argued that there is any obligation on the part of any industry to continue over-manning in order to maintain employment. No industry could stand that. However, the answer to the question at the head of this short article is clouded with doubt.

The Road Tar Association.

A striking feature of Presidential Addresses and speeches which are made where professional gas men meet together is the considerable commendation that the British Road Tar Association is receiving. This is well merited; and we should like to emphasize the official utterances. The Association is engaged on valuable work for all producers of tar, but confronted by strongly backed competitors for preference in what has become a very large outlet—in fact, the largest and most convenient outlet—for tar. It is for the maintenance and enlargement of that outlet that the Association is functioning, and of this tar producers must not lose sight, for co-operative effort can work effectively in many directions where the best of individual endeavour cannot. Naturally an Association of this character does not make public display of all its doings—does not, for instance, divulge from the housetops the ramifications of its operations—any more than do competitors. It would not be politic; but we have knowledge that much is performed and accomplished of which no public mention is made. The appeals for the fullest support can be answered with the fullest confidence. We have in these days to deal with competition in scientific and not haphazard manner; and every one of the secondary products of the gas industry has now its rivals, and tar not the least in respect of keenness. Therefore, we have to order our commercial doings in relation to it in a way which will preserve our markets and broaden their area. Mr. P. N. Langford, who is a member of the Managing Council of the British Road Tar Association, we see from the report of the proceedings at the Midland Association meeting (published last week), spoke of the activities of the former organization in the matter of propaganda; and he correctly accentuated the important work it is doing in endeavouring to find ways and means of making better road tar than has been obtainable in the past. At the same time, as is the case with our other central commercial organizations, what the Road Tar Association is doing must be supplemented by local work—by every gas engineer, as Mr. Langford said, doing all possible in his own area to bring to the notice of road surveyors and others the value of tar for their purposes. In the Presidential Address of Mr. C. Valon Bennett to the Southern Association of Gas Engineers and Managers (as published last week), he also referred to the important work of the British Road Tar Association; and he emphasized the point that, although the organization has the highest ideals and ambitions, it rests with the manufacturers and distillers of tar to supplement their efforts by seeing that the material they sell is of the best quality for the various purposes for which it is used. He made the point that standards are being, or have been, set to meet the requirements of the road authorities; and he urged that, if it is impossible for any ordinary gas-works satisfactorily to meet those standards, then the crude tar should be sent to distillers where production of suitable material will have the attention of those who have made a life study of such matters. It is true that it is only by such means that we can hope to meet the acute competition of other preparations which are being pushed for treating road surfaces.

The Weyman Fund.

The contributions of the late Dr. Geoffrey Weyman to the scientific and technical work of the gas industry were highly valuable to the professions of gas chemistry and engineering. We all remember his keenness, his originality in thought and act, and the care with which he entered upon everything he undertook—all of which when he wrote or spoke claimed from those who read or heard their closest and most respectful attention. It was recognized that had he been spared, he would not have dwelt in the rank-and-file of the industry's workers; he would have earned a front place among those who make scientific research and control of industrial operations their life's work. Young as he was when he died (only 38 years of age), he had through his intellectual gifts enriched the world and the carbonizing industries by his work; but unfortunately he had not enriched himself other than intellectually. Hence it is that he was unable to make adequate provision for his widow and three children, whose education friends desire should be as the father would have wished. A number of scientific, chemical, and engineering friends are minded that this shall be, and therefore they have initiated a fund which, in due course, will be invested in Trustees to provide primarily for the education of the children. For this they are asking for subscriptions from those who knew Dr. Weyman, or who had been interested or instructed by his work. The names at the foot of the circular before us are: T. L. Bailey, P. P. Bedson, J. W. Cobb, H. G. Colman, W. B. Davidson, Arthur Duckham, J. T. Dunn, E. V. Evans, Thomas Hardie, H. Hollings, C. H. Lander, H. Dunford Smith, F. P. Tarratt, Fred West, Arthur Smithells (Chairman), E. W. Smith (Hon. Secretary); and T. F. E. Rhead (Hon. Treasurer), Central Laboratory, Gas-Works, Nechells, Birmingham. We know these names, and in the gas industry they need no titles or placing. They are a sufficient guarantee. We feel that there are many who will desire that the cutting short of a valuable life of one who was known to all of us shall not jeopardize the educational future of his children for the want of necessary funds. It is noted in the circular that any amounts remaining after the objective is achieved will be handed over to the benevolent funds of the Institutions by the Trustees. We hope that the Hon. Treasurer (Mr. T. F. E. Rhead) will be able early to report that the appeal has been highly successful.

Summer Time.

The dates at which summer time will come into force in various countries this year are as follows: Great Britain, April 21-22; France, April 14-15; Belgium, April 14-15; Spain, April 14-15; and Holland, May 15.

A Fuel Exhibition and H.T. Carbonization.

Among the several items of interest in the minutes of the Central Executive Board of the National Gas Council (published in a later column) is one referring to the World Power Conference. In connection with this, it is suggested that there shall be a Fuel Exhibition, consisting of models of plant and machinery used in the preparation and utilization of fuel. A Special Committee has been appointed to consider and report on the question. For the Conference itself, the National Gas Council, the Institution of Gas Engineers, and the Society of British Gas Industries are to be invited to appoint one or more of their members to deal in a paper with the subject of high-temperature carbonization. Mr. Thomas Hardie and Mr. E. J. Fottrell have been asked to watch the position, with power to co-opt if the necessity arises.

Hire-Purchase Legislation.

In the "Journal" for Jan. 4 (p. 26), an article was noticed which Mr. W. Eric Jackson, LL.B., Barrister-at-Law, contributed to the "Electrical Review" on the Hire-Purchase Bill, 1927. That Bill has been dropped by its promoters, apparently on the ground that it did not give sufficient security to dealers in hire-purchase. A new measure has been substituted, to be known as the "Hire-Purchase Bill, 1928." In a further article,

Mr. Jackson deals with the terms of the new Bill, which he regards as more concise and satisfactory from the dealer's point of view. The measure is directed to the same objects as the 1927 one; but it makes good certain omissions. The design of the predecessor was to avoid risk of seizure of goods by outside parties during the term of the agreement. Under the present law, every owner of goods who lets them out on hire or hire-purchase is open to the risk that, if the hirer goes bankrupt or cannot pay the rent of his premises, the trustee in bankruptcy may seize the goods, or the landlord may take them by distress, and in many cases the owner of the goods is entirely without any means of redress. Mr. Jackson points out that the new Bill contains extended provisions whereby no goods comprised in a hire-purchase agreement or simple hiring agreement shall be subject to distress for "rent, rates, water-rents, gas and electricity charges." This clause leaves out taxes, which apparently will still be a lawful object for distress. But as distress for income-tax and other King's taxes is far less common than distress for rent and rates, a dealer may consider himself suitably protected if the Bill in its present form becomes law. The provisions with regard to bankruptcy are substantially the same in effect as in the 1927 measure. Goods hired "shall not be divisible among the creditors of a bankrupt hirer." Certain fixed machinery, heating and lighting systems, and such apparatus will, if so built in as to become permanent, be the landlord's property, in spite of the fact that the tenant is not complete owner of the articles. Other points are dealt with in the article by Mr. Jackson, who regards the new Bill as a great improvement from the dealer's point of view; and he considers it should be welcomed as an attempt at last to confer a long-awaited and much-needed protection to dealers in this class of transaction.

Safeguarding of Industries.

It is understood that, in view of the General Election next year, the Government are busy exploring the policy of the safeguarding of industries. It is desired to ascertain the precise effects on trades which have been given the assistance of duties on foreign imports; and the outcome of the investigation will probably be a decision as to whether there may be a wider application of the policy without violating pledges already given. It is considered that the policy has thoroughly justified itself, and that there might now be some relaxation of the conditions which have to be fulfilled before an application from an industry can succeed.

A Survey of British Industry.

In the fourth preliminary volume, prepared by the Committee of Industry and Trade, under the title of "Further Factors in Industrial and Commercial Efficiency," there are a number of interesting facts. Between 1913 and 1925, the power capacity in heavy industries, it is stated, rose from less than 8 million H.P. to upwards of 13·75 million H.P. A wide discrepancy, however, exists between an increase in H.P. and the increase in productivity per head of working population. Industrial costs increased by 80 to 90 p.ct. during the period; wages averaging between 30 to 40 p.ct. of total costs. The working week has had its length reduced by about 10 p.ct. Over-capitalization is criticized as fettering freedom and paralyzing initiative in those running businesses. Another point is that the retailer charges more for his services than the manufacturer as compared with pre-war figures.

Notts Miners' Industrial Union.

Recently, as our readers are aware, the General Council of the Trade Union Congress intervened in the matter of the relative positions of the Miners' Industrial Union and the Notts Miners' Association. The latter, it will be remembered, has lost its influence in numbers and recognition, while the Miners' Industrial Union—the non-political organization—has gained the effective place, and is the recognized representative organization with whom the coal owners enter into conference and agreement. The General Council of the "T.U.C.," failing in their efforts to obtain recognition for the old Notts Miners' Association, which is a member of the Miners' Federation, suggested that a ballot should be taken in the district to determine which organization the men wished to support. The Industrial Union have rejected this proposal. They declare that, as a very large percentage of those employed in the Nottinghamshire collieries are not now members of the Notts Miners' Association, that organization has lost power to function, and both numerically and financially is utterly ineffective. Thus the Executive of the Industrial Union suggests that a ballot would necessarily be inconclusive and unproductive of practical good. In view of this, it is understood the General Council of the "T.U.C." are making arrangements for taking an independent ballot, but that will be of little use if the Industrial Union men decline to take part in it. Naturally a majority in favour of the Miners' Association could be shown on paper by its members forming the greater proportion of those who voted, with the Industrial Union men standing aside. That would not make the slightest difference to the Industrial Union and the coal owners. The General Council of the "T.U.C." had better confine themselves to beneficial work, and not waste time over something that can have no useful issue.

Burden of Rates.

The Engineering Employers' Federation have issued a memorandum in which they deal with the burden of local taxation. That these burdens are becoming intolerable all will admit. The increases in unemployment, local taxation, and social services are accused of having built up an impost on output which has trebled since 1913. The memorandum indicates the extent of the burden represented by unemployment benefit and poor-law relief. It is computed that industry contributes at least one-fourth of the total local rates in Great Britain. In 1914 these rates amounted to £79,000,000; in 1926, to £166,000,000. Approximately one-third of the sum was spent on poor relief last year. Poor relief rose from £20,091,419 in 1919 to a calculated figure of £54,000,000 in 1927. It is also alleged that there are many persons in receipt of poor law relief *plus* unemployment benefit. The incident of this burden, with workmen's compensation and national insurance, in relation to a ton of steel, represents an advance from 4s. 1d. in 1913 to 11s. 1d. in 1923. It is also asserted that the cumulative load of rates and social charges in reference to raw or semi-manufactured materials is equal to at least 9 to 10 p.ct. of the selling price of its product.

Wages Bill of Trade Unions.

A return has lately been presented to Parliament by the Minister of Labour, which discloses some remarkable figures in respect of salaries paid by leading trade unions to their officials. The details refer to registered trade unions with over 10,000 members during 1925-26. Among others, it is seen that the Transport and General Workers' Union paid £199,222 under this heading; the General and Municipal Workers, £119,151; the Workers' Union, £86,284, including a sum of £37,795 for organizers' wages and expenses; and the Railwaymen's Union £104,446. As an example of losses suffered by the trade unions as a result of the general strike and the miners' strike in 1926, the following may be quoted: At the beginning of 1926, the National Union of Railwaymen had funds amounting to £1,911,500; at the end, £532,803. The Transport and General Workers' Union at the beginning of the year had £486,548; at the end, £91,393. The Railway Clerks' Association had at the beginning £309,957; at the end, £119,833. The Locomotive Engineers' Society possessed at the beginning £260,196; at the close, £109,543. The Yorkshire Mine Workers' Association, with a membership of 164,196 in 1925, began 1926 with funds amounting to £492,712; they ended the year with 84,246 members, and a deficiency of £120,490. Most of the other county associations likewise had deficiencies; and all suffered in membership and funds. Up to the present, they have not succeeded in recovering their position in either respect.

Scottish Junior Gas Association (Eastern District).—There is to be a visit on Saturday next, April 14, to the Gothic Works, Falkirk, of Messrs. R. & A. Main, Ltd., on which occasion Mr. Arthur Forshaw, Chief Chemist to the firm, will lecture on "Flues and Ventilation, with special reference to Housing Schemes."

PERSONAL.

Mr. ROWLAND MACANSH, who is a Director of the Warwick Gas Company, Ltd., the farthest inland Gas Company in Queensland, left for England on March 28, and is due in London on May 10.

Mr. S. BARKER JOHNSON, Engineer and Manager of the Colombo Gas and Water Company, Ltd. (whose London office is at 148, Gresham House, E.C.), has just arrived in England from Ceylon on six months' furlough.

At the annual meeting of the London Section of the Society of Chemical Industry, Mr. W. J. A. BUTTERFIELD was re-elected Chairman.

Our congratulations and best wishes are offered to Mr. A. C. SLAUGHTER, on his appointment as Editor of the "Gas World," in succession to the late Mr. Peter Robertson.

Mr. T. THORNTON, Manager, Engineer, and Secretary of the Rowley Regis and Blackheath Gas Company, and Hon. Secretary and Treasurer of the Midland Association of Gas Engineers and Managers, has been elected a member of the Rowley Regis Urban District Council.

On Friday afternoon, March 30, the dining room at the Gas-Works, Crowlands, was the scene of a happy function, when the two sections of the Gas Department combined for the purpose of offering some token of esteem and regard to Mr. THOMAS ROWELL COOK, the Deputy Engineer, on the occasion of his leaving Southport to take up duties as Engineer and Manager to the Rotherham Corporation gas undertaking. The gift consisted of a beautiful inlaid mahogany timepiece, with Westminster chimes. The chair was taken by Mr. Russell Johnson (Chief Clerk); and tributes to Mr. Cook were paid by Mr. John Bond (Gas Engineer) and other officials.

Mr. GEORGE MARSHAM, who was Chairman of the Maidstone Gas Company, and who died on Dec. 2, at the age of 78, left unsettled estate of the gross value of £79,104, with net personalty £62,269.

To mark the occasion of his seventieth birthday, Mr. JOHN J. TYSON, Outside Gas Superintendent at Burslem, has been presented by the office staff with an ebony walking stick. Mr, Tyson has served in the Burslem Gas Office for over forty years.

On March 31 Mr. H. BUTTERFIELD, who for the past twelve years has been Manager of the Cowes Gas-Works, was made the recipient of a silver inkstand from the staff and employees on the occasion of his retirement. The presentation was made by his successor (Mr. R. A. GRETTON).

The wedding took place at Fleetwood Wesleyan Methodist Church, on Monday, of Mr. ROBERT JACKSON (Clerk to the Nuneaton Gas-Works, and formerly in the service of the Fleetwood Gas Company) and Miss Muriel Warwick, eldest daughter of Mr. and Mrs. E. Warwick, of Fleetwood.

On March 30 an interesting ceremony took place at the Altrincham Gas-Works, when Mr. GEORGE POPE was presented with a gold watch on leaving to take up his new duties as Technical Assistant at the Corporation Gas-Works, Workington. Mr. Pope has served his time as an apprentice at the Altrincham Gas-Works, and for the past three years has been acting as Assistant to the Manager. In making the presentation on behalf of the Directors and employees, Mr. T. Fairhurst (Managing Director) referred to the great success which Mr. Pope had obtained in connection with his classes at the Salford Technical College, and also to his ability in carrying out all the work entrusted to him. Mr. C. H. Svers (Deputy Chairman) and Mr. H. R. S. Williams (Engineer and Manager) added words of appreciation.

ELECTRICITY SUPPLY MEMORANDA.

MANY mishaps have occurred through the unfriendly association of gas pipes and electric wires; and there need not have been so many if wiring contractors and gas-fitters had taken the necessary precautions, and kept them apart in a way which would prevent their co-operation for mischief. Where there is fusion of internal gas-pipes, electric wires are the cause that produces the effect in which gas is concerned, and which gives it publicity and a black mark which it does not deserve. If allowed to go on with its service unmolested, its conveying pipe would not be perforated, and gas would not escape. In a little booklet which has just been published from the "JOURNAL" office, and which should be distributed freely among electrical wiremen and gas-fitters (for gas and electricity undertakings are interested in this matter, and both would like to see immunity from such avoidable accidents), there is packed a considerable amount of useful information presented in plain form. It is entitled "The Electrical Fusion of Gas Pipes." It is by Mr. H. C. Widlake, A.M.I.E.E., Chartered Electrical Engineer, of the Plymouth and Stonehouse Gas Light and Coke Company. In this he sets out first to show, by examples, from his own personal experience what constitutes a dangerous state of affairs in connection with the installation both of gas pipes and electric wires in houses. There are cases illustrated—actual occurrences be it marked—which we hope reputable electrical contractors would strongly denounce. Take a single instance. In one room it was found that the notches that had been cut in the joists for the accommodation of a ¾-inch gas-pipe had been subsequently enlarged for the reception of three lead-sheathed twin electric conductors. A few inches to the right of this mix-up of gas and electric wires, notches had been cut right across the joist for two further electric circuits. Mr. Widlake remarks that it is difficult to imagine why all five conductors were not laid in this line of notches, and so kept absolutely clear of the gas-pipes. The fusion of gas-pipes by electricity is practically an instantaneous process, and can be due to bad workmanship or material, or owing to the installation having been allowed to lapse into a dangerous condition. There is information for the uninitiated on the subject of short circuits, plainly and lucidly told. Earthing is described. Five classes of wiring are dealt with. There is the screwed conduit system, the slip-joint conduit system, the lead-sheathed system, wood casing system, cab-tyre sheathed system. The first three mentioned are of the greatest interest in that they possess the common feature of a metallic protecting sheath, which is liable to become "alive" in the event of the conductor insulation becoming damaged or perished. This damage lies at the root of the trouble forming the subject of the booklet. Among the illustrations we see a photograph which shows clearly the arrangements with which any properly executed electrical installation is provided, in order to ensure that the conduits in which the wires are enclosed are connected to the general mass of earth. Information is given as to what constitutes dangerous practices in an installation job. The action of fuses, electricity supply regulations, ideal installation conditions, and the duties of employers are other subjects. It is a valuable booklet; and it goes to the kernel of things in respect of dangerous installations of the two systems of domestic operation, which dangers all employers—gas and electric—must be anxious to avoid. To place this little book in the hands of their employees who are engaged on such work is a duty, and will we are sure be a safeguard. Perhaps it might be mentioned that specimen copies can be obtained from the publishers at 6d. each, and quantities at the prices mentioned on p. 29 of the "JOURNAL" last week.

Gas Pipes and Electric Wires.

False Information.

It is hard to believe—and it is hoped we are misinformed—that there can be any truth in the statement of an electrical contractor (in a communication to a prospective consumer) that—

> The latest published information by the Electrical Development Association on the subject of the relative costs of lighting states that the average inverted gas-burner consumes 3·75 c.ft. per hour, and the average candle power given is 40. Therefore 1000 c.ft. of gas will give 270 hours' burning, equal to 10,800 c.-p.-h.

On the other hand, the contractor says, one unit of electricity will give 1800 c.-p.-h. Thus, taking gas at 3s. per 1000 c.ft. and electricity at 6d. per unit, electricity will give for 3s. 10,800 c.-p.-h., which is the same as gas at 3s. per 1000 c.ft. The efficiency given above for gas is only equal to 10·66 c.p. per c.ft. of gas consumed. Is it true the "E.D.A." has been guilty of publishing such a falsehood concerning gas, when, with the latest forms of low-pressure gas-burners, an efficiency of 25 candles per c.ft. of 500 B.Th.U. gas is readily and demonstrably obtained? If the Director of "E.D.A." admits that the statement referred to actually emanated from the Association, and they are prepared to defend it, we shall be pleased, if he desires it, to make arrangements for him to carry out photometrical tests of modern gas-burners. Again, is it true that the Association have published information that a unit of electricity will give 1800 c.-p.-h.? This is a claim to an efficiency of 1·8 c.p. per watt. The fair average of the testings of a number of gasfilled lamps is 0·75 watt per candle power, which is 1·33 c.p. per watt, or 1333 c.-p.-h. per unit. Thus the true comparison of the lighting relationship of the agents—using modern burners of good makes, and taking the prices given by the electrical contractor (which we have privately seen)—is that 1000 c.ft. of 500 B.Th.U. gas at 3s. will give 25,000 c.-p.-h., and six units of electricity at 6d. per unit 7998 c.-p.-h. If "E.D.A." have ever published figures such as those ascribed to them, then they ought to be withdrawn, and true ones substituted, It is not right that business should be

sought on such false bases, which are a snare and a delusion to the uninformed layman.

Reliable Lighting for Hospitals.

The numerous failures of public electricity supplies during the past six months caused Mr. Lee to ask the Minister of Transport in the House of Commons on March 27 whether, in view of the danger of interrupted electricity service in hospitals and similar institutions, alternative supplies are being established or recommended by his Department. Col. Ashley confessed that he had received a number of complaints as to failures, but no specific representation as to the danger of interrupted service in hospitals and similar institutions. Of course, Col. Ashley is not so blind as to be unaware that, if a hospital, infirmary, prison, or other public institution, is involved in a failure of electricity supply, there must be danger. But Col. Ashley went on blandly to tell his interrogator that one of the objects of the schemes of interconnection to be carried out under the Act of 1926 is to ensure increased reliability of supply for authorized undertakers whose systems will be linked-up in due course with the main transmission system of the Central Electricity Board. That sounds plausible enough, and perhaps will satisfy members of Parliament who have not the knowledge to enable them to go a step further with their inquiries. The points of interconnection of systems are the limits of one section only of the scope of unreliability. Between the points of interconnection and the consumers, there are the local distributing cables and services, and therein fusions and other forms of breakdown occur. The question Mr. Lee put bore upon the question of safe lighting for hospitals and other public institutions, and we would add the streets. It is the duty of our authorities to ensure that everything possible is done to maintain the continuity of lighting in such places. We hardly like to give pain to our electrical friends; but it ought to be said that the form of lighting which has proved to be the most reliable is that in which gas is employed as the agent, and not electricity.

"A Main Evil."

Miss Wilkinson is trying to persuade her fellow members of the House of Commons that no new underground offices and workrooms should be allowed. We hope she will succeed. The House gave her permission to bring in a Bill "to regulate offices and the employment of young persons therein, and for other purposes connected therewith." The measure is to prevent overcrowding in offices; to stop premises being occupied as underground offices which are not so used on the date that the Bill passes into law; and it makes provision for adequate ventilation, lighting and heating, and proper sanitary accommodation. Regarding lighting, it appears that Miss Wilkinson has been learning something. In her speech on March 20 as reported in the "Parliamentary Debates," we read: "There are several main evils under which these people work at the present time. First and foremost, there is electric light. Many workers have to work in offices with artificial light, not only on dark days, but all day and every day, and right through the heat of the summer. This is not only the case in regard to old buildings, but it applies also to new buildings. In one of the best and newest offices lately built in the City of London, large provision is made for underground office accommodation. In the older buildings in the City where girls work underground, conditions are very bad indeed." One girl who wrote to Miss Wilkinson described the office in which she was employed as "only a cubicle, with no windows and no ventilation; and five men besides herself worked in this unhealthy place." She added that "the electric light had had a bad effect on her eyes; and she had been obliged to go and see an oculist, who said her eyes were badly strained." Electric lighting is receiving unpleasant prominence in the House of Commons, which not long ago suffered a failure, which interrupted the work of our legislators. But fancy being called "a main evil!"

A Testimonial for Coke.

Several articles have recently appeared in our electrical contemporaries on domestic water heating and thermal storage systems. Mr. Edward Dixon, who is a Director of Messrs. Olliver & Addis, Ltd., of Margate, has written on the subject to the "Electrical Review," and has given his personal experience with the heating of domestic water by coke. He describes as excellent the suggestions put forward in the articles to which he alludes—from the electrical point of view; but, from the power station standpoint, it seems to him they are all beside the point. He mentions an article, in the issue of our contemporary for March 23, in which the author (Mr. R. J. Hebbert) says he requires 17 KW.H. to raise 40 gallons of water from 49° to 195°, and this for storage only. It will be seen that the difference between the temperature of the inlet water and that required is 146°; multiplying this by 400 lbs. (40 gallons), we have a total of 58,400°; while 17 KW.H. has a potential heating value of 58,004 B.Th.U. Thus Mr. Hebbert's 17 KW.H. supplies something short of the required heat, and allows nothing for heat losses during the long-period process of heating-up in the storage tank. That, with all its shortcomings, is probably the best case that can be put forward for a limited hot water service with electricity as the agent; but here is what Mr. Dixon says as to his personal experience over two years in providing his household with an unlimited supply of hot water night and day: "I have for the last two years been running a small domestic boiler for household purposes, supplying baths, hand basins, kitchen, and two radiators when required, with 50 gallons storage capacity, running night and day on coke at a cost on an average of not more than 3s. per week." "Can you beat it?" asks Mr. Dixon of the Editor of the "Review." "Until you can, the application of electricity for domestic heating is out of the question." The Editor has not replied to the question. Perhaps he is wise.

Central England. Scheme.

In the editorial columns of the "Journal" for March 28, information was given regarding the scheme the Electricity Commissioners have drafted for the Midlands. This is their third contribution to the concentration of the generation of current under the national scheme. We will not here traverse the particulars already supplied; but they may be supplemented. In the area involved in the scheme, there are 46 generating stations in operation or authorized, and of them 19 have been "selected," and 6 others have been named for temporary retention. The four principal stations of the 19 are Hams Hall (Birmingham); Ironbridge (West Midlands Joint Electricity Authority); North Wilford (Nottingham); Stourport and Smethwick (Shropshire, Worcestershire, and Staffordshire Electric Power Company). These stations are situated on the Rivers Severn and Trent, and are within easy reach of the coal-fields. There are in the areas sources of waste heat which, the Commissioners think, may be usefully employed. To the 19 stations large additions of plant are contemplated. Overhead primary transmission lines are provided for, to be operated at 132,000 volts between phases; the carrying capacity of each line being not less than 50,000 KW. Ring mains for adjoining areas are a feature in the design. The cost of the primary transmission system, and the transforming stations associated therewith (including certain secondary transmission lines), after allowing for the capitalization of interest during the first five years, is estimated at £3,640,698. Detailed investigation into the cost of effecting the complete standardization of frequency in the South-West Midlands Electricity District, on the assumption that the work of changing over would be begun this year, and be continued without interruption, shows that the cost would be about £2,061,400. On the basis of interest at 5 p.ct., and a 40-year sinking fund computed on the 3½ p.ct. table, the annual capital charges for standardization would amount to about £129,000. The annual charges in respect of cost of standardization of frequency in this and other areas will be brought into a separate account, and will fall to be apportioned by the Commissioners on a prescribed basis, and be borne by all authorized undertakers throughout the country. By the end of the financial year 1934-35, it is calculated that the capital expenditure under the Midlands scheme by the Central Board on transmission and standardization of frequency, and by the owners of selected stations on their construction and extension will be: By the Central Board: Transmission lines and transforming stations (including the capitalized interest), £3,597, 679; standardization of frequency (total estimated cost), £2,061,400. By owners of selected stations: New station (Ironbridge) and extensions of stations (162,500 KW.), £1,975,000. These three items make a total expenditure of £7,634,079.

Savings and Other Items.

The Electricity Commissioners discuss what would take place in comparison with their scheme by individual development by the Joint Electricity Authority, Power Companies, and other undertakers. It is computed that the existing undertakers would have to make provision by 1934-35 for the installation of additional generating plant of a capacity of 418,065 KW., to meet the load in that year and further immediate growth. This would represent a capital expenditure of £4,780,150. By that year, part of the existing spare plant in various generating stations will have been released for revenue earning purposes—amounting in the aggregate to about 60,000 KW., and representing an actual expenditure of something like £1,020,000. Deducting the cost of standardization, and allowing for non-release of spare plant in the absence of the scheme, the system of interconnection for the Central England area, providing improved facilities for subsequent development, can (the Electricity Commissioners remark) be effected by a capital expenditure to 1934-35 of £3,597,679, as compared with an investment of £3,825,150 under the existing régime. That is to say, £4,780,150, less £1,975,000, *plus* £1,020,000. The additional advantages, by reason of reductions in the cost of generation, and savings in expenditure which would otherwise have been necessary on secondary transmission lines by individual undertakings, are taken into account. It is estimated that at the end of 1934-35 the total saving will have been £1,401,892. In the estimates, the expenses of the Central Board are taken to be a flat-rate charge of 0·0425d. per unit from the commencement of supply.

Other figures show progressive decrease in the average cost of supply by the Central Board to authorized undertakers from 0·495d. per unit in 1930-31 to 0·426d. per unit in 1934-35. The operation of the scheme, it is also calculated, will enable the Board to accumulate a surplus of £608,885 by the end of 1934-35. In the editorial in the March 28 "Journal," questions of anticipated consumption and prices were dealt with.

Mishaps. The "Glasgow Herald" reports that Daniel Kay (25) was electrocuted while at work in the Salsburgh Colliery of the Coltness Iron Company, Ltd. At the time of the accident, Kay was using an electric hole-boring machine; and it is presumed that trouble occurred with one of the wires. Missing from his home since the previous Wednesday, Charles Valencia (16) was last Friday week found in an old power shed near the Bute Dry Docks, Cardiff, lying across two live wires. It is supposed (the "Western Mail" says) that he entered the shed in order to obtain shelter. Thieves should beware: "Electrocuted while about to commit a felony" was the verdict at an inquest at Cardie on Samuel Edgar Laventine on the 27th ult. The report in the "Newcastle Chronicle" states that, according to the police, the shed in which Laventine was found had been broken into; and the body was stretched across two pieces of cable. In Sheffield last Saturday week, through an accident at the Neepsend power station, the tramway service was temporarily held up.

EVENING STAR LODGE, No. 1719.

Installation Meeting.

On March 28, in the Grand Temple of Freemasons' Hall, took place the Installation Meeting of the Evening Star Lodge, No. 1719. There was a good attendance of the members and of visiting brethren. At the commencement of the proceedings the Chair was occupied by the retiring Master, W.Bro. Fred G. Cockey, who conducted the usual preliminary business leading up to the installation of his successor, W.Bro. A. L. Croager, who is the son of the Treasurer, W.Bro. A. E. Croager, P.M., P.P.G.D., Kent.

All the officers were present with the exception of the Secretary, W.Bro. Rae P. Normand, P.M., whose absence was owing to the death of his mother. The brethren passed a vote of sympathy with him, and with W.Bro. William A. Surridge, P.M., P.A.G.D.C., who was closely related to Mrs. Normand ("Henrietta Rae"), and asked the Acting Secretary, W.Bro. Walter T. Dunn, to convey the terms of the resolution to them.

The following are the officers for 1928-29:

W.M.	W.Bro. A. L. Croager
I.P.M.	W.Bro. Fred. G. Cockey, P.M.
S.W.	W.Bro. James Foreman
J.W.	Bro. John A. Brentnall
Chaplain	W.Bro. Frank West, P.M.
Treasurer	W.Bro. Arthur E. Croager, P.M.
Secretary	W.Bro. Rae P. Normand, P.M.
Dir. of C.	W.Bro. Arthur H. Henry, P.M.
S.D.	Bro. Albert B. Potterton
J.D.	Bro. Thomas F. C. Potterton
Organist	Bro. John F. Simmance
I.G.	Bro. William H. Warren
Stewards	W.Bro. Reg. W. Foster, L.R. Bro. W. F. Broadberry Bro. G. D. Bidwell
Tyler	W.Bro. R. H. Goddard

After the installation ceremony, Mr. David Terrace was proposed for initiation by his father (Mr. John Terrace, Chief Engineer of the South Suburban Gas Company), and seconded by W.Bro. A. E. Broadberry, P.M., L.R. He was balloted for, elected, and duly initiated.

The Lodge having been closed until the fourth Wednesday in May, the company adjourned for dinner in the Connaught Rooms, where the new Master, W.Bro. A. L. Croager, ably presided. The customary toasts were honoured; "The Visiting Brethren" being responded to by (among others) W.Bro. Sayers, representing the Northern Star Lodge, and W.Bro. Milbourne, representing the Murdoch Lodge. The toast of the "Initiate" was proposed in felicitous terms by W.Bro. Broadberry, and Bro. David Terrace suitably replied. A pleasing incident of the evening was a presentation made by Bro. Grant and his brother Initiates to the I.P.M.

The announcement was made that the well-known Bute Lodge, of Cardiff, had invited all the masonic members of the Institution of Gas Engineers, who would be attending the Annual Meeting in that town, to be present on Monday, June 11, at an Emergency Lodge which would be called for the purpose of welcoming them. The Lodge would be in the usual meeting place at Cardiff, and would be followed by supper and an entertainment in the Park Hotel. Details of all the arrangements will be issued by the Bute Lodge to every masonic member of the Institution in good time to enable replies to be returned.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

April 13.—British Commercial Gas Association.—Conference of the South Western District at Ilfracombe.

April 14.—London and Southern District Junior Gas Association.—Visit to the tankless holder and showrooms at Woodford, and the Stratford Works of the Gas Light and Coke Company.

April 14.—Scottish Junior Gas Association (Eastern District).—Visit to the Works of Messrs. R. & A. Main, Ltd., Falkirk.

April 14.—Western Junior Gas Association.—Presidential Address of Mr. Arthur Marsden.

April 18.—Yorkshire Junior Gas Association.—Visit to the Works of Messrs. Chas. Roberts & Co., Ltd., of Horbury. Paper by Mr. W. Lofthouse on "Traffic Problems."

April 21.—Wales and Monmouthshire Junior Gas Association.—Annual meeting at Newport.

April 24.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at Tunbridge Wells.

April 25.—Manchester and District Junior Gas Association.—Visit to the Derbyshire Silica Fire Brick Company, Ltd., Friden.

April 28.—Midland Junior Gas Association.—Visit to the Apedale Pits of the Midland Coal, Coke, and Iron Company, Ltd.

May 3.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—General meeting at Tredegar (Mon.).

May 4.—North of England Gas Managers' Association.—Annual general meeting in Newcastle, 2.15. Papers by Mr. L. H. Sensicle ("Recovery Methods and the Ammonia Problem") and Mr. W. L. Robertshaw ("Notes on the Design, Maintenance, and Working of Coal and Coke Handling Plants").

May 8.—National Gas Council.—Meeting of the Central Executive Committee.

May 8.—Federation of Gas Employers.—Meeting of the Central Committee.

May 9.—British Commercial Gas Association.—Conference of the Midlands District at Redditch.

May 16-17.—Eastern Counties Gas Managers' Association.—Meeting at Bedford.

May 17.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, W.C. 1, under the presidency of His Grace the Duke of Sutherland.

May 18.—Southern Association of Gas Engineers and Managers.—Visit to the works of the Rochester, Chatham, and Gillingham Gas Company.

May 22.—Central Committee of the Federation of Gas Employers.—Meeting at the Hotel Cecil, 10.30.

May 22.—Central Executive Board of the National Gas Council.—Meeting at Hotel Cecil, 11 o'clock.

May 22.—Federation of Gas Employers.—Annual general meeting at the Hotel Cecil, 2.15.

May 22.—National Gas Council.—Annual general meeting at the Hotel Cecil, 3 o'clock.

May 24.—British Commercial Gas Association.—Conference of the Cornish District at Truro.

The Institution of Gas Engineers.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

April 28.—Examination in Gas Engineering and Gas Supply held at centres in England, Wales, and Scotland.

May 1.—Refractory Materials Joint Committee.

May 7.—Sub-Committee of Gas Investigation Committee, to be held at Leeds University.

May 8.—Executive Committee of Gas Education Committee.

May 22.—Gas Investigation Committee in morning. Effluents Research Committee in afternoon.

June 12-15.—Annual General Meeting at Cardiff.

July 10.—Gas Education Committee.

Oct. 9.—Gas Education Committee.

Nov. 13.—Executive Committee of Gas Education Committee.

Dec. 11.—Executive Committee of Gas Education Committee.

Gas in Hotels and Boarding-Houses.—No 169 of "A Thousand-and-One Uses for Gas" describes the methods used for cooking, heating, and ventilation in one of the most up-to-date hotels, and in residential chambers. The hotel described is the May Fair, and its equipment fully exemplifies modern efficiency and comfort.

Gas Journal Calendar and Directory.—We thank our numerous friends from Australia, New Zealand, United States, Canada, and other distant parts (including many Continental subscribers to the "Journal") who have written congratulatory letters on the "Gas Journal Calendar and Directory," with their thanks for the complimentary copies.

NATIONAL GAS COUNCIL.

A Meeting of the Central Executive Board of the National Gas Council took place on April 3, at 28, Grosvenor Gardens, S.W. 1—Sir David Milne-Watson, LL.D., D.L., in the chair.

The Late Mr. P. Robertson.

The Chairman referred to the loss the gas industry had sustained in the death of Mr. Robertson, late Editor of the "Gas World," and a vote of sympathy was passed, all the members standing.

Annual Report.

The draft annual report of the Council for the twelve months ended March 31, 1928, was submitted and approved.

Ammonia Recovery.

Discussion with regard to this matter was resumed from the last meeting, and it was decided to ask the Effluents Committee of the Institution of Gas Engineers to form a Sub-Committee specially to deal with this question of ammonia recovery forthwith.

Gas for Clinical Purposes.

A report was submitted from the Technical Committee of the Institution of Gas Engineers who had been asked by the Board to investigate this matter.

International Illumination Commission.

Communications were considered from the National Illumination Committee of Great Britain and from the British Engineering Standards Association respectively, stating that a meeting of the International Illumination Commission was to be held in America in September next, and inviting the Council to send a representative to America to attend the Commission along with other delegates representing British interests. It was reported that the Institution of Gas Engineers was being represented by Mr. Watson, of Doncaster. It was decided that it would not therefore be necessary to appoint a further delegate.

Conjoint Conference of Public Utility Associations.

It was reported that a meeting of the Executive Committee of the above conference, representing gas, water, electricity, tramways, and light railways, had met on March 28, when the following matters were considered:

(*a*) *Bridges Bill.*—It was stated that this was a Private Member's Bill, the object of which was to amend the law with respect to bridges and roads carried thereby, and the approaches thereto. The Bill conferred certain powers on highway authorities and bridge owners in relation to bridges or viaducts "for the maintenance or repair of which some person other than a highway authority is responsible." No provision was made for the protection of public utility undertakers, and the Conjoint Conference was therefore making representations to the Minister of Transport to remedy this.

(*b*) *Trustee Act, 1925.*—It was reported that it had been agreed that the gas and electricity interests should ask for the same concessions as were enjoyed by the water interests—viz., that the guaranteed debenture and preference stock of statutory companies who had paid a dividend of 5 p.ct. for the preceding ten years on their ordinary stock should rank as trustee stock. This question was being taken up with the Treasury.

(*c*) *Rating and Valuation Bill, 1928.*—While the primary object of this Bill was to extend to London the provisions of the principal Act of 1925, certain provisions were of universal application. These general provisions were unsatisfactory in many respects, and an amendment had been obtained in regard to one point in the House of Commons. Endeavours were being made to obtain further amendments during the passage of the Bill through the House of Lords.

World Power Conference—Proposed Fuel Exhibition.

It was reported that it had been suggested that, concurrently with the World Power Conference, there should be a Fuel Exhibition, consisting of models of plant and machinery used in connection with the preparation and utilization of fuel. A Sub-Committee had been appointed to go further into the possibilities of holding such an exhibition.

It was also decided to invite the National Gas Council, the Institution of Gas Engineers, and the Society of British Gas Industries to appoint one or more of their members to deal with "High-Temperature Carbonization."

Mr. Thos. Hardie and Mr. E. J. Fottrell were appointed to watch the position, with power to co-opt if the necessity arose.

Making Easter Eggs by Gas.—No. 170 of "A Thousand-and-One Uses for Gas" explains how chocolate eggs are made. It contains many interesting illustrations showing the various processes—from the roasting of the cocoa beans by gas, to the final operations, when a skilled girl puts beautiful raised leaves, flowers, and other designs on them.

THE ÆSTHETICISM OF GASHOLDERS.

(From a Correspondent.)

A good deal has been heard in the last year or two about the (to put it mildly) obtrusiveness of gasholders in the landscape, which would without them be beautiful. Suggestions have been made as to painting them so as to bring them more into harmony with the colour of their natural surroundings; and thus to lessen in some degree any justification there may be for the hypercritical attitude which some members of the public assume when gasholders are mentioned. Our interest in the matter was revived some time ago when it came to the knowledge of the writer that a gas engineer declined to consider the suggestion of some of his technical friends, and also some of the oil companies trading in filming oil (interested parties, of course) that he should try a film of suitable oil for the surface of his gasholder water, so that evaporation might be prevented, and the gas in the holder kept free from moisture, with obviously good results in various directions, which are well known to all members of the gas engineering profession. His reply was "No," as such oil would not only cover the surface of the holder water and be of advantage to the interior surface of the plating, but it would also adhere to the exterior surface of the plates, rendering the holder unsightly. Rising and falling in the greasy oil-filmed water, the outside of the holder, said he, would be anything but "a thing of beauty," with, therefore, not the remotest possibility of being "a joy for ever," as every object in physical life and Nature should be.

No less a personage than the Earl of Sandwich has lately been giving testimony as to the beauty of the commonplace gasholder. He says that "windmills are out of date now, but gasometers (*sic*) are beautiful."

Be it known that Lord Sandwich includes among his many other accomplishments that of connoisseur of art. At his Huntingdonshire house may be seen a collection of very beautiful paintings of all epochs. Therefore the gas industry may take heart of grace, and not bewail, as it sometimes does, that the gasholder is a hideous necessity of its business. Decidedly it is not; we have the word of an art connoisseur for it.

What will the gas engineer now do about it? Of course, he will be much elated, as will also "his wife, his sisters, his cousins, and his aunts," for ladies, *cela va sans dire,* are admittedly "arty," and would without doubt follow the opinion and the guidance of our respected Earl.

If an opinion might be entered upon here, it would be to declare that, with regard to the exteriors of such prominent and practically permanent objects as gas containers throughout the country (especially in rural areas), every effort to preserve the amenities of the landscape should be encouraged. What is the practical objection, in addition to the oil-filming suggestion, to covering each holder with a good metal-preserving and artistically coloured composition? This could be renewed every year without exception. What do the readers of the "Journal" think about this, which is really an all-important matter to them and to the public in general?

The gradually growing tendency towards the construction of waterless gasholders—immovable structures—accentuates the importance of the problem. Here, the rising and falling part of the holder is contained inside the polygonal tower. In the ordinary columnar, spirally guided, and other designs of holders, as the gas passes to the district the bell of the holder is gradually lost to vision. The spirits of the purist landscapist rise in proportion to the falling movement of his accursed gasholder.

Institute of Fuel.—A meeting of the Institute will be held at the Chemical Society's Rooms, Burlington House, Piccadilly, W. 1, on Wednesday, April 18, at 6 o'clock. The chair will be taken by Mr. Roger T. Smith, the President of the Institute of Transport, and a paper entitled "The History and Development of Anti-Detonating Agents for Motor Fuel" will be read by Mr. H. S. Tegner, B.Sc., A.M.I.A.E., and will be open for discussion. Advance copies of the paper can be obtained on application to the Secretary, Mr. P. C. Pope, at 53, Victoria Street, S.W. 1.

Royal Society of Arts.—By permission of the Board of Governors of the Imperial Institute, the public exhibition of works sent in for this year's Competition of Industrial Designs will be held in the Exhibition Pavilion of the Imperial Institute, South Kensington, S.W. Full particulars of the scholarships and prizes offered in connection with the Competition can be obtained from the Secretary of the Royal Society of Arts, Adelphi, W.C. 2. Applications for forms of entry, labels, and instructions must be sent to the Secretary of the Society between May 1 and May 12. Designs entered for the competition are to be forwarded to the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, S.W., between June 18 and June 20; and after the judging, which takes place in July, the accepted designs will be on view at the Imperial Institute from Aug. 4 to Sept. 1 (Sundays included).

THE INSTITUTION OF GAS ENGINEERS.

APPLICATION FOR A ROYAL CHARTER UNANIMOUSLY AUTHORIZED.

THE DAWN OF A NEW ERA.

Proof of the wide active interest taken in the proposed Royal Charter was to be found in the large muster of members at the Special General Meeting of The Institution of Gas Engineers which was held on Monday, April 2, at the Institution of Electrical Engineers, Victoria Embankment, London, for the purpose of considering the draft of the proposed Petition, Charter, and By-Laws for submitting to His Majesty's Privy Council, as recommended by the Council of the Institution. The President (Mr. H. D. MADDEN, M.Inst.C.E., Engineer and General Manager of the Cardiff Gas Light and Coke Company) was in the chair; and he was supported by Mr. John Terrace (Senior Vice-President), Mr. C. S. Shapley (Junior Vice-President), Mr. W. E. Price (Hon. Secretary), Mr. Henry Woodall, Senior, Sir Henry Maybury, K.C.M.G., C.B., Mr. H. C. Smith (Tottenham), Mr. F. C. Briggs (Dudley), Mr. H. H. Gracie (Edinburgh), and other members of the Council, together with the Secretary (Mr. Walter T. Dunn). There were also present Dr. Charles Carpenter and Sir Arthur Duckham, K.C.B. The photograph reproduced on p. 27 of last week's issue of the "JOURNAL" shows that on the wall behind the President was displayed a framed portrait. This was of the late Thomas Hawksley, F.R.S., Past-President Inst.C.E., First President (1863-1865) of The Institution of Gas Engineers.

The PRESIDENT, who on rising was greeted with applause, said, in opening the proceedings: We are meeting to-day in circumstances which are unique in the history of our Institution; and I am very pleased to see that we have a good attendance. The interest taken in this matter of a Royal Charter has been very wide; and I am glad to welcome here to-day a number of distinguished gentlemen who have come here to-day to support us. I would specially mention Dr. Charles Carpenter, of the South Metropolitan Gas Company, Sir Henry Maybury, Mr. Henry Woodall, and Sir Arthur Duckham. We have names there of engineers who have done great things for our industry. I intend to be brief this morning, because there are other speakers coming after me who will detail to you the provisions of the Charter, of which I think every member has had a copy. I would like to say that the Framing Committee have done a great deal of careful work in the preparation of this draft. It has been done, not only paragraph by paragraph, but literally word by word. Still, you will see that there are one or two little points in it that need altering. We know that is so, and attention will be drawn to them.

"THE INSTITUTION OF GAS ENGINEERS."

The chief one, to my mind, is that by mistake the word "British" has been inserted before "Institution of Gas Engineers" in the final paragraph of the Petition. This will come out. This Institution was, and is, and I hope always will be, "The Institution of Gas Engineers." We do not want any distinguishing title, because I think we were the first in the world to hold that position. I would like also, in introducing this matter to the meeting, to say how it became built up. Of course, the Education Scheme was a step towards it; and that has been in operation now for five years. The Junior Associations pressed for the Education Scheme; they also pressed for membership of the Institution. The Council felt that the time had arrived when the doors of the Institution should be widened, and the foundations upon which it is built should be extended, so that we might include within our ranks engineers of eminence who are not actually in control of gas undertakings. There are many men eminent in their profession engaged with our contracting firms whose advice, help, and criticism would be of great assistance to the gas industry. I think at this time we want the aid of everyone we can get who can help us in the great cause in which we are engaged—the supply of light, heat, and power to the citizens. We want all the help we can get which will enable us to give the people a supply, not only of gas, but also of coke and other products, of the very highest quality at the cheapest possible rate; and this aim will be materially advanced if we secure the co-operation of every trained brain, not alone of those engaged with gas undertakings, but of those who are working with contractors on plant extensions and investigations.

HONOUR WHERE HONOUR IS DUE.

Perhaps I may be permitted at this juncture to say how much the Council and the Institution are indebted to Mr. H. C. Smith, the Engineer of the Tottenham District Light, Heat, and Power Company, and Mr. Francis C. Briggs, the Engineer of the Town of Dudley Gas Light Company. [Applause.] Mr. Smith wrote me the other day, and said: "You must begin by this time to think me a confounded nuisance." But I must tell you that we owe a great deal to the enthusiasm of these two Engineers, who have, in connection with the Framing Committee, done what I may term the "donkey work;" and I should like to take this opportunity of acknowledging it.

I will now ask Mr. Smith to move, and Mr. Briggs to second, the resolution which has been circulated authorizing the application for a Royal Charter.

AMENDING THE RULES.

Mr. H. C. SMITH (Tottenham): It is with very great pleasure that I rise to propose the resolution entrusted to me to-day. I fully appreciate the importance of the steps which are being taken to amend the rules governing the admission of members to the Institution, and also the Petition which it is proposed to make for a Royal Charter. In the opinion of many members the granting of a Royal Charter to an Institution with such a record of valuable work as the Institution of Gas Engineers is long overdue; but until the rules governing membership are altered so as to enable the Institution to represent properly the technical side of the gas industry interpreted in a wide sense, and also until such times as these rules are tightened-up to ensure that intending members give proof of their technical training and qualifications as gas engineers, it has been felt that the chances of success of a Petition for a Royal Charter were small.

The proposals culminating in the draft Petition for the grant of a Royal Charter which are submitted to-day for our approval have had the very serious consideration of your Council. I think I might almost say that for some time the Council deemed them too serious even to consider. [Laughter.] Even the most revolutionary of us have a certain amount of conservatism in our make-up, and when we have got a good thing feel sometimes that it is safer not to interfere, lest in trying to effect improvements we only succeed in marring the good work carried out by our predecessors.

NECESSITY EMPHASIZED BY COMPETITION.

We must be prepared, however, to march with the times. The competition we have to face to-day is far keener than any experienced in our industry before. Not only have we to meet the fair competition of our friends in the electrical industry—who again to-day, as on many previous occasions, have loaned to us the use of these premises—but this competition is backed-up by what we consider to be the unfair Covernment boosting of our rival industry. I would not for one moment suggest that any such competition is needed to spur on the gas engineer to give of his best in the interest of the community he serves; but it does emphasize the necessity for adopting new methods if these are likely to result in benefit to our industry and the community. ["Hear, hear."] In my opinion, the amended rules cannot but improve the standing of the Institution. They open the door to those engaged in technical departments outside gas undertakings but inside, and forming a part of, the gas industry, provided they have received a satisfactory technical training and are able to give proof of their technical qualifications. The presence of such members at our meetings, and the technical information they will be in a position to contribute, must prove of great value to each of us individually and to our Institution. I do not propose to take up your time by detailing the several ways by which candidates will be able to qualify for membership under the proposed amended rules. Mr. Briggs, who is to second this resolution (and who is generally known on the Council as my co-conspirator), is, I understand, going to deal with those points. Membership by examination will undoubtedly be an attraction to the juniors who are growing up in the industry. They will appreciate that success in the Institution's examinations, instead of merely entitling them to a certificate, will also assist to qualify them for corporate membership. Instead of a candidate for a vacant position in the future saying, for instance: "I hold the Higher Grade Certificate of the Institution," he will say: "I am an Associate Member of the Institution of Gas Engineers;" and this will be an indication that he possesses certain definite qualifications. Unfortunately, that would not be the case to-day.

THE RESOLUTION.

The linking-up of the Education Scheme with membership of the Institution, and the widening of the doors, must in themselves do much to advance the usefulness and technical status of the Institution; but the increasing prestige to be gained by the granting of a Royal Charter will be incalculable. The chances of success in our Petition for this Royal Charter are greatly increased by the amendments made to the rules governing admission. In fact, without such amendments it would be a waste of time to petition. It is very gratifying to know that our petition is supported wholeheartedly by the co-operative

bodies in the gas industry, who wish us every success. The President has referred to the little work that Mr. Briggs and I have done in proposing or suggesting these amended rules. I think that applying for a Charter for the Institution is a very old idea, and that we have merely suggested it again at a time when we happened to have a President in the chair who was in full agreement with us and offered wholehearted support. I firmly believe that the proposals we are considering to-day must result in lasting benefit to the industry we are proud to serve; and I have much pleasure in moving:

> That the Council of the Institution be, and they are hereby, authorized to present to His Majesty in Council a Petition (in the form of the draft which has been submitted to this meeting and which for the purposes of identification has been signed by Mr. Henry Dacre Madden, the President of the Institution) praying for the grant of a Royal Charter in the terms of the draft which has also been submitted to this meeting and for the purposes of identification signed by the President, or in such other terms as to His Majesty may seem proper; and that the Council be, and they are hereby, also authorized to submit for the approval of the Lords of His Majesty's Most Honourable Privy Council the proposed By-Laws of the Institution proposed to be incorporated by the said Royal Charter in the form of a draft which has been submitted to this meeting and for the purposes of identification signed by the President.

The President's Interest.

Mr. Briggs: I beg formally to second the resolution which Mr. Smith has proposed; and in doing so, I am very conscious of the high honour you have conferred upon me by allowing me this privilege. I should like, in the first place, to associate myself very closely, Sir, with what Mr. Smith has said as to your own part in this matter. When we first suggested that this thing might be done, it was the knowledge that we should receive your full support that gave us courage to face the matter. I feel, perhaps, that we owe you an apology for so much work having fallen upon you in connection with the furtherance of the scheme which has been put forward. And there is another name that should be mentioned in this connection. When we first faced the scheme, we felt that the line to take was to amend the rules, and then perhaps at a later date to apply for the much-desired Royal Charter; but it appeared during discussion that it would be both practicable and wise to apply for the Charter at the same time that the amended rules were considered. In fact, it would save double cost. This emerged at one Committee meeting, and at a subsequent Committee not more than a fortnight later, we were presented, for consideration, with a draft in print of the petition for the Royal Charter and the amended rules. This must have been almost entirely the work of the Secretary, Mr. Dunn, aided by the Solicitor, Mr. Shrimpton. This shows the enthusiasm with which the Institution is served by its Secretary. ["Hear, hear."]

Details of the Scheme.

A general outline of the reasons for the scheme has been given by Mr. Smith; and perhaps I might occupy a few minutes only in referring more definitely to the details. All along the idea has been to throw open the doors of the Institution to thoroughly trained practical men, wherever employed in the gas industry, in its widest sense, and then to make membership of the Institution essentially a matter of training and examination, so that in the future we may be sure of getting into the Institution every properly trained gas engineer, and also ensure that every member is a properly trained gas engineer. The whole thing hinges really upon a few rules. In the By-Laws there is a very important definition. For the purposes of these By-Laws:

> "The Gas Industry" means (*a*) the manufacture or distribution of town's gas, or (*b*) the design or construction of works machinery plant or apparatus for the manufacture, distribution, or use of town's gas, or (*c*) the manufacture or working-up of bye-products by gas undertakings, or (*d*) research work connected with the manufacture or distribution of town's gas or its application.

The words "the products," in the draft is a misprint for "bye-products." Thus a properly trained man employed say, for the sake of example, on the tar works at Beckton is eligible for membership of the Institution. This complete definition throws open the doors of the Institution to everybody properly trained who is employed in the gas industry in its very widest sense.

Rules for Membership.

When we come to the rules governing membership, they are somewhat involved as printed; and if you will allow me, I will just analyze these, and show you exactly what they do mean.

[It will facilitate full appreciation of Mr. Briggs's subsequent remarks if the rules as they stand in the draft are reproduced here.—Ed. "G. J."]

Members.

13. Every candidate for election or transfer into the class of Members shall be actually engaged in a responsible technical position in the gas industry, and shall come within one of the following conditions, namely:

Either

A. He shall be the holder of the Diploma of the Institution or the predecessors of the Institution in Gas Engineering or Gas Supply, in which case he shall, save as aforesaid, require no further qualification, or

B. He shall be not under 30 years of age and either.

(1) Shall for at least five years at the time of his application have held a responsible position in the gas industry as head of a technical department, and either (*a*) be an Associate Member of the Institution, or (*b*) be a corporate member of the Institution of Civil Engineers, or (*c*) possess a B.Sc. Degree of a British University or such other degree as in the opinion of the Council is an equivalent scientific or engineering degree; or

(2) Shall in the opinion of at least two-thirds of the members of the Council present at the meeting of the Council which shall consider his application have had a suitable education and training in the gas industry, and, for at least fifteen years at the time of his application, have held a responsible technical position in the gas industry, and have acquired a considerable degree of eminence in the profession of an engineer in the gas industry.

Associate Members.

14. Every candidate for election or transfer into the class of Associate Members shall either be the holder of the Diploma of the Institution or the predecessors of the Institution in Gas Engineering or Gas Supply, or come within the following conditions, namely:

(1) He shall be not under 21 years of age, if a Student of the Institution, at the time of his application, but if not such Student he shall be not under 25 years of age; and

(2) Shall possess the Higher Grade Certificate of the Institution or the predecessors of the Institution in Gas Engineering or Gas Supply, or an approved Degree of a British University in the subject of Gas Engineering; and

(3) He shall (unless he is a Student of the Institution) at the time of his application have had, for at least five years, such training for a responsible technical position in the gas industry as the Council deem sufficient; and

(4) Shall at the time of his application hold a responsible technical position in the gas industry.

Associates.

15. Associates shall be persons not under 21 years of age who, by reason of their professional knowledge or experience, are considered by the Council qualified to assist in promoting the objects of the Institution.

Students.

16. Students shall be persons not under 18 and not over 24 years of age who either (1) possess the Ordinary Grade Certificate of the Institution or the predecessors of the Institution in Gas Engineering or Gas Supply, and are undergoing technical training in the gas industry of a character approved by the Council, or (2) are studying for the B.Sc. Degree in Gas Engineering as internal students of a British University.

Exceptions to the Above.

17. Notwithstanding the provisions of By-Laws 12, 13, 14, 15, 16, and 34 and subject to the provisions of By-Law 37, no person who is by virtue of Clause 11 of the Charter an Honorary Member, Member, Associate Member, or Student at the date when these By-Laws came into force shall by reason thereof cease to be an Honorary Member, Member, Associate Member, or Student, as the case may be; and up to and including the 31st day of December, 1930, the Council may admit as candidates for election as or transfer into the class of Members or Associate Members and may admit as Students any persons who would have been qualified to be so elected or transferred or admitted under Articles 6, 7, 10, and 32 of the Articles of Association of the predecessor of the Institution.

It is visualized that the ordinary member of the Institution should enter via the studentship. At age 18 he can take up the Ordinary Grade Certificate in Gas Engineering or Gas Supply, and having obtained that certificate he may join the Institution, provided he is undergoing practical training. If he proceeds to take the Higher Grade Certificate, which he can obtain at the minimum age of 20, at 21, having been a student, he can become an associate member of the Institution, if he is in a responsible technical position; and then at the age of 30 he can transfer to full membership, if he has been five years at the head of a technical department, and is still in a responsible technical position. All these things are matters for consideration by the Council as to interpretation; but I may suggest that the chief chemist on a gas-works would be in a responsible technical position and head of a technical department, and likewise a man definitely in charge as works superintendent and possessing the necessary technical training. There is an alternative in that if a man is studying for the B.Sc. Degree in Gas Engineering as an internal student of a British University, that qualifies him for studentship; while for associate membership the actual Degree is offered as an alternative to the Higher Grade Certificate of the Institution. When a man does not become a student, the rules are the same; but he can only become an associate member at the age of 25, instead of 21 if he comes in as a student. If a man holds the Diploma of the Institution, he can become an associate member at 25 years without further qualification, and if he is in a responsible technical position he can become a member. The present Education Scheme of the Institution is only open to people employed in gas undertakings; but it is quite obvious that the scheme will need amending to some extent to fit in

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with the new Charter, and whether it shall be amended to take in everyone is a matter for the Council to decide.

Then comes the question of how people can get in who are employed in contractors' works. They can enter at the age of 30 years as full members; but they must be in a responsible technical position, they must have had five years as the head of a technical department, and they must be either corporate members of the Institution of Civil Engineers or possess a B.Sc. Degree of a British University or equivalent scientific Degree—that is, equivalent in the opinion of the Council.

At St. Paul's Cathedral—and at many other ecclesiastical buildings—one enters through a small door at the side; but in the centre of the front there is a very large door, opened only to admit special persons on State and similar occasions. The Institution has in its membership rules such a large door, which is to be opened only on certain special occasions. There is a rule for membership to admit those men who, refusing to follow along common lines of academic training, have yet, in spite of this, become particularly eminent, and without whom the Institution will be at a loss. They are allowed to come in as full members, if they have had a suitable education and training, and have served for fifteen years in a responsible technical position, and if they have, in the opinion of the Council, acquired a considerable degree of eminence in the profession of an engineer in the gas industry. That is a rule framed almost exactly on the lines of a corresponding rule of the Institution of Civil Engineers, the institution which we are quite proud to admit as the father of engineering institutions.

That is the way in which people get into the Institution. Then one might mention the rule whereby they get out. [Laughter.] One has had to consider these rules very carefully, in order to arrive at exactly the result which one feels everyone desires. One does wish to have every eminent engineer and every properly trained technical man; but one does not desire the purely selling element in our Institution, because the Institution does not appear to be quite the place where it should be represented. Therefore there is a rule to this effect:

> 37. The name of any Member or Associate Member who shall have ceased to be engaged in the gas industry (otherwise than on retirement from business) shall be removed from the register or list of the Institution; but he shall be liable for any subscription that may be due from him at the date of such removal. The decision of the Council as to whether any person has ceased to be engaged in the gas industry or not shall be final and conclusive.

The Council are relieved of all responsibility in the matter if a man ceases to be engaged in the gas industry as already defined. For example, without casting any reflections on the trade which is quite an honourable one, if a man is purely engaged in selling coal, he ceases to be a member of The Institution of Gas Engineers.

Subscriptions.

There is one other rule to which I ought perhaps to refer; and that is the one bearing upon the matter of subscriptions. In future, if this draft goes through, every member upon election will pay an entrance fee of £2, and an annual subscription of £3, in place of 2 guineas. Every associate member and associate upon election will pay an entrance fee of £2, and an annual subscription of £2, instead of the present 1½ guineas; and every student will pay an annual subscription of £1, instead of 10s. 6d. I am perfectly certain that this will meet with no opposition at all, because the increased value of the Institution will be infinitely more than the increased subscription. With these few remarks, I beg formally to second the resolution proposed by Mr. Smith.

The President: Before I put the resolution, there are one or two gentlemen we should like to hear in support of it. Sir Henry Maybury has to leave early to keep an appointment; and I will ask him to say a few words now.

Royal Charter Much Overdue.

Sir Henry Maybury: It affords me very much pleasure to support you heartily in your endeavour to obtain a Royal Charter. I have listened with great interest, and with a certain amount of gratification, to the very able explanation of Mr. Smith and Mr. Briggs; and I think, as an old member of The Institution of Gas Engineers, that the acquisition of a Royal Charter by this Institution is much overdue. ["Hear, hear."] I do not care to remember how long it is ago that I became a member of the Institution; but whatever the period, I gladly recognize the great work which the Institution has done, and the progress that has been made since these early days on the technical and manufacturing sides of gas engineering. I assure you, Sir, that I value the honour you have done me by asking me to be here this morning to support you in your endeavours. I gladly will do all I can for the Institution.

Dr. Charles Carpenter Supports.

The President: You have heard the proposer in reference to the Charter, and you have heard the seconder. I do not know whether there are any points which you would like elucidated. If so, Mr. Shrimpton, our Solicitor, who has been responsible with Mr. Dunn for framing it, is here, and will be pleased to deal with questions from the legal aspect. I am delighted to see that Dr. Carpenter is present; and we should welcome him if he would kindly come on to the platform.

Dr. Charles Carpenter: I have not yet quite recovered from an illness last December, but felt I must come here to-day to support the Chair. I have the greatest admiration for the occupant; and that being so, I desire to raise my hand in favour of the proposal which will be put to the meeting. I would rather remain where I am than come to the front.

A Point in the Petition.

Mr. Samuel Glover: I do not think mine is a point that will need to be submitted to the Solicitor; but I should like to ask a question for the purpose of, I hope, emphasizing the importance of the Petition, inasmuch as I was greatly impressed by the assertion that we "alleviate the acuteness of the problem of road transport, thousands of tons of coal, which would otherwise be carted by road for delivery to the consumers, being now carbonized in gas-works." Why "thousands," and over what period of time? I think it will assist our young and enthusiastic friends, who are helping us in the work we have been hoping to carry through for a long time, if that word is altered into something nearer to the truth. As it is, it expresses nothing. I think I might ask that this shall have consideration.

The President: Instead of "thousands," you want it strengthened-up a bit. The Solicitor suggests an amendment should be proposed, because it must be passed to-day.

Mr. Glover: I do not think I need to. It is quite sufficient for me to make the suggestion. The Council and those who have been preparing this scheme are not "blind horses;" and they will appreciate either a wink or a nod.

The President: You want it altered to the word "millions?"

Mr. Glover: Well, the very fact that you have asked that answers the question. I have raised the matter merely to show others that we are not asked to vote blindly for anything put before us.

The President: The Solicitor advises me that it will have to be put as an amendment to the resolution. Will someone second it, so as to put the matter in order?

Mr. H. E. Bloor (York): I will second it.

The amendment was put to the meeting and carried unanimously.

The Oldest Member.

The President: I will now call upon Mr. Henry Woodall, who has attended here to-day, to speak on the Charter and the position of the industry.

Mr. Henry Woodall, Senior: In rising to respond to this call, I cannot but feel that there is a certain appropriateness in my presence here this morning. Those of you who were fortunate enough to be present on that great occasion at the Hotel Cecil about eight months ago, will recall that Sir David Milne-Watson pronounced me the doyen of the gas profession. I was a little bit startled at the time; but since then I have thought things over, and I have found that it is not sufficiently inclusive. I have carried my thoughts over the five Continents, I have summed up the number of inhabitants of this world (who are reputed to total 1600 millions), and I happen to be the one who first of all amongst them breathed the air of a gas-works. [Applause.] It is 89 years ago almost to this very day; and had it been put to me, I might have preferred "the scent of the cowslip and primrose sweet." But there I was. From early life, I have been entirely given up to gas affairs, and many very happy recollections I have of community with fellow engineers and others associated with gas—always with one exception.

An Interesting Reminiscence.

But the things I have spoken to you about are points which are perfectly immaterial. It does not matter to you, or to me, where I was born, or when. Let us come to something more intimate. In 1863, I was one of the few fellows who put their heads together and eventually formulated what became known as the British Association of Gas Managers. By a curious accident, I did not happen to be present when that Association was formed. It is a little story that may interest you, and there is certain amusement about it. I received a circular regarding the first meeting, and I attended it at the Royal Hotel, Manchester. A week or so later I received another circular, which I put aside; but I remembered the date and the hour of the meeting. I took it for granted that it would be at the same hotel as before; and I went there and asked for the meeting of gas managers. I was courteously shown upstairs, a door was opened, and I was ushered into a room. I looked around. They were not the men I had seen a week before. Those whose acquaintance I had made then were lean, hungry looking men. These were sleek men; men who slept o' nights. I listened to the reading of a paper, and sure enough it was about gas; but in the course of a minute or two I found it was a report, and so I said to the man next to me: "This is not a meeting of gas managers?" "Well," he replied, "in a sense it is. This is a meeting of the Gas Committee of the Manchester Corporation." [Laughter.] I thought the best thing to do would be to go to the Manchester Gas-Works; but we young fellows were far in advance of the

time. They knew nothing of the matter at the Bradford Road Gas-Works; and so I returned home very much disappointed.

A Great Ambition Realized.

However, that Association was formed in 1863; and later on I was asked by a dear friend what was my ambition. I replied that my great ambition was to be the President of the Gas Managers' Association and to make the cheapest gas in Britain. I accomplished both puposes. [Applause.] Then while I was the President of that Association, a very serious thing took place. There was a disturbance among us, which eventuated in the breaking-away of all the best men of our Association; and I sat in the chair, and had to look upon them as they trooped out. There were Livesey, Trewby, Foulis, Hunt, my brother Corbet, and ever so many of them. Well, it was a very sad occurrence at the time; but it has eventuated in what we must now regard as a very providential circumstance, for the membership of that Association had become loose and characterless. Had we continued, we could never have met, as we have to-day, with the ambition of being lifted up on a higher plane among the Societies of Britain. I am very happy indeed to support the resolution which has been put to you, for I believe it will result in the ennobling of a very valuable profession and also in benefit to the country. [Applause.]

The President: Before I formally put the resolution to the meeting, the Solicitor advises me that, in order to make it strictly legal, there are one or two slight alterations you ought to agree to as well. I will ask him to mention them.

Mr. Shrimpton: They are very slight, and are mostly in the nature of printers' errors. An amendment has already been passed to substitute the word "millions" for "thousands" of tons.

Mr. Glover: And I hope a period of time.

Mr. Shrimpton: Annually. Then there is the omission of the word "British," which has crept into the title by mistake. It should be "The Institution of Gas Engineers." Then in the definition of the gas industry, under (*c*), there is another printers' error. "Bye-products" should be substituted for "the products." Then in By-Law 14 (relating to associate members), sub-section 2, the concluding words "or Gas Supply" should be omitted. [These words have been deleted from the clause as reproduced in this report.—Ed. "G. J."] These are the only alterations.

Mr. J. P. Leather: The alteration is to be to "millions of tons annually?"

Resolution Unanimously Adopted.

The President: Yes; that is adopted. You have heard the resolution that has been proposed by Mr. Smith and seconded by Mr. Briggs; and you have heard it supported by Sir Henry Maybury and Mr. Henry Woodall. You have also heard the Solicitor refer to one or two slight alterations, to which you agree. I now put it to the meeting that you empower the Council to petition for the grant of a Royal Charter. Will those in favour kindly signify in the usual way? To the contrary? Gentlemen, it is unanimous. [Applause.]

Votes of Thanks.

The President: I now call upon Mr. Gracie to propose a vote of thanks.

Mr. H. H. Gracie (Edinburgh): We have had a most interesting meeting and much valuable information. Our President has emphasized the vast amount of work which has been carried out by Mr. Smith and Mr. Briggs; and I ask you to accord them a most hearty vote of thanks for this work.

Sir Arthur Duckham: I have much pleasure in seconding the vote of thanks to the two gentlemen who have done so much work. Any one of us who has performed work of this character must appreciate the value of what they have done. I think the great thing about it is the speed at which it has been done. I am certain that this is a great day for all of us here, and that those two gentlemen whom we are thanking have done work of inestimable value to us. [Applause.]

Mr. J. Terrace: While we are on this matter, I beg to move that a very hearty vote of thanks be given to our Secretary, Mr. Dunn, and to the Solicitor, Mr. Shrimpton, for the work they have performed.

Mr. C. S. Shapley: I have much pleasure in seconding that. [Applause.]

The President: I would like to add my appreciation of the very able support that we have received from the gentlemen referred to. That concludes the business of the meeting.

VISIT TO STAINES.

WATERLESS HOLDER AND GAS DRYING PLANT.

In the afternoon, members, to the number of 200, visited the Staines Station (to which they were conveyed by a fleet of motor coaches) of the Gas Light and Coke Company, where they were received by Mr. J. Neath (the Engineer of the Works). Seen in the bright sunshine of an ideal spring afternoon, the beautiful situation of the works, right on the bank of the River Thames, made its appeal; but the visitors had more serious, and, from a professional point of view, more interesting, matters to occupy their minds, in the shape of two specially novel features.

Before, however, referring to these, it may be pointed out that the Staines Station came into the Gas Light and Coke Company's undertaking as the result of the Brentford amalgamation in 1926. The present gas manufacturing plant consists of twelve beds each of six horizontal retorts 22 in. by 16 in. section and 18 ft. long, charged by a De Brouwer projector charger; the capacity of the retort house being 75 tons of coal, or 1 million c.ft. of gas, per day. Besides this, there is a water gas plant comprising two 300,000 c.ft. per day Humphreys & Glasgow carburetted sets. An addition of three further beds of retorts is in hand, so that the capacity of the works for the winter 1928-29 will be 1,250,000 c.ft. per day coal gas and 600,000 c.ft. water gas—a total of 1,850,000 c.ft. per day.

Waterless Gasholder.

The first of the novel features to receive attention was a waterless gasholder in an advanced stage of construction which is being erected by Messrs. E. Cockey & Sons, of Frome; the contractors for the foundations being Messrs. K. Holst & Co., of 1, Victoria Street, London, S.W. The holder will have a capacity of 1½ million c.ft. The dimensions are: Diameter, 110 ft.; height to eaves of roof, 177 ft. In shape, the holder is an eighteen sided polygon built of specially formed plates. The plates are 19 ft. by 2 ft. 8½ in., of a thickness of 4½ mm. The total weight of the steelwork is 500 tons.

The tar seal of disc holds 1600 gallons; and the maintenance of this seal is secured by eight pumps driven by 1-H.P. motors, each of which is estimated to make eight runs of four minutes' duration during the day. The total tar lifted should be about 1280 gallons per 24 hours; the quantity in the seal and storage tanks being 3400 gallons. The disc of the holder is loaded with 200 tons weight of concrete blocks, so as to throw a uniform pressure of 12 in. water gauge.

The top of the shell is formed into a lantern with glazed sides, and provided with escape pipes to release any gas that might get above the piston if the holder disc be raised too far. Access to the interior of the holder for inspection of the disc, seal, &c., is provided by a series of staircases between the horizontal galleries around the outside of the holder leading to a manhole in the roof. From this manhole a short ladder leads to a landing, from which depends a double folding ladder attached to the disc. The inlet and outlet pipes are 18 in. in diameter.

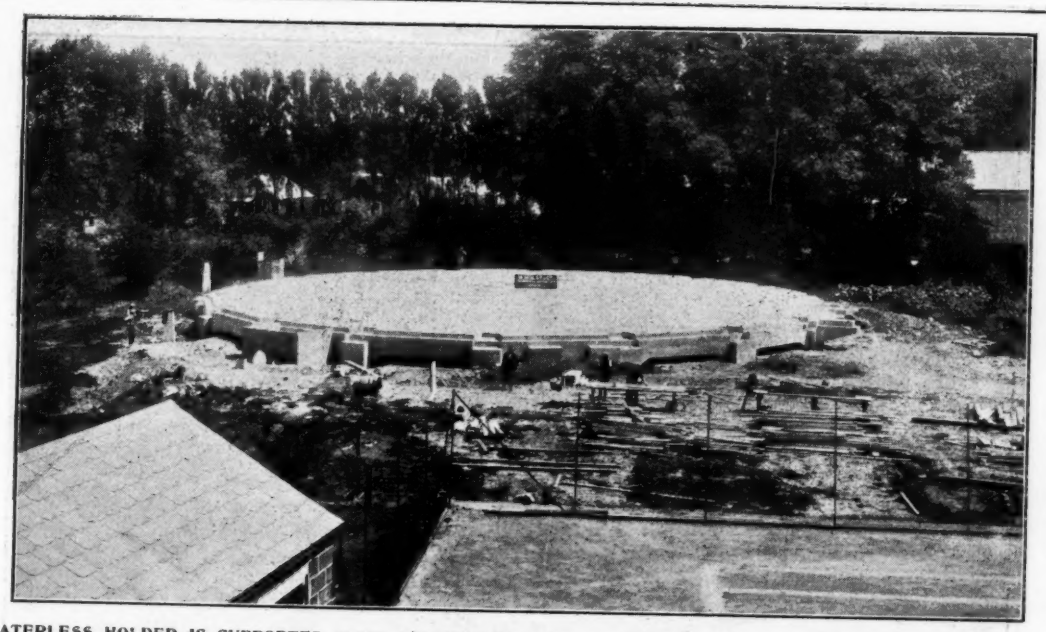
The holder is supported upon a combined mass and reinforced concrete foundation, the load upon which is less than 100 lbs. per sq. ft., except around the circumference, where the maximum load is 1 ton per sq. ft.

Gas Drying Plant.

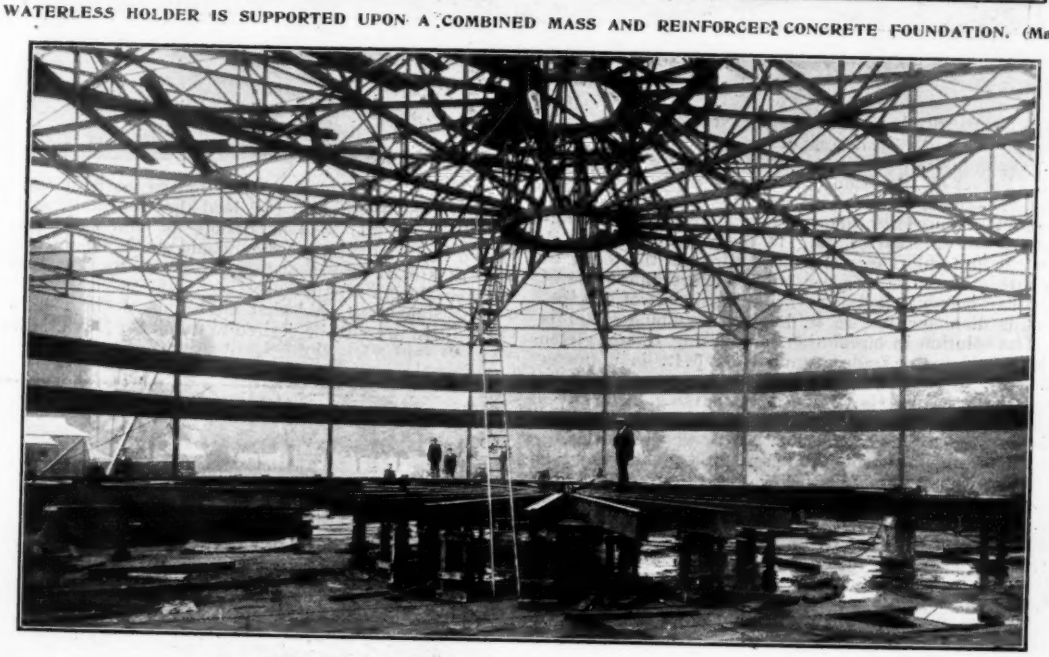
The gas drying plant, which was supplied by Messrs. W. C. Holmes & Co., of Huddersfield, is of their "Dri-Gas" patent type, and was designed to deal with the whole output from the Staines Works, being placed at the outlet of the holder, where it would have to treat a maximum rate of 150,000 c.ft. per hour. The object of the design is to ensure that the plant can be kept in operation without altering any of the adjustments throughout the cycle of changes occurring in the 24 hours; and the back-pressure was required to be the minimum practicable.

The absorbing vessel consists of a tower scrubber built in halves, of ⅜ in. and 5/16 in. mild steel plates, welded together, the filling being wood boards in several tiers. The liquor sprays have no moving parts, and are practically unchokable. In operating the plant, a complete circulation is kept up from the storage tank by means of a pump through the coolers into the absorber, and back through the latter to the tank. The coolers are of the tubular type, and are designed for combined air and water cooling, although it is actually found that at certain periods of the year air cooling is sufficient. The rate of circulation is maintained at a high figure; and the change in concentration during passage through the absorber is relatively small.

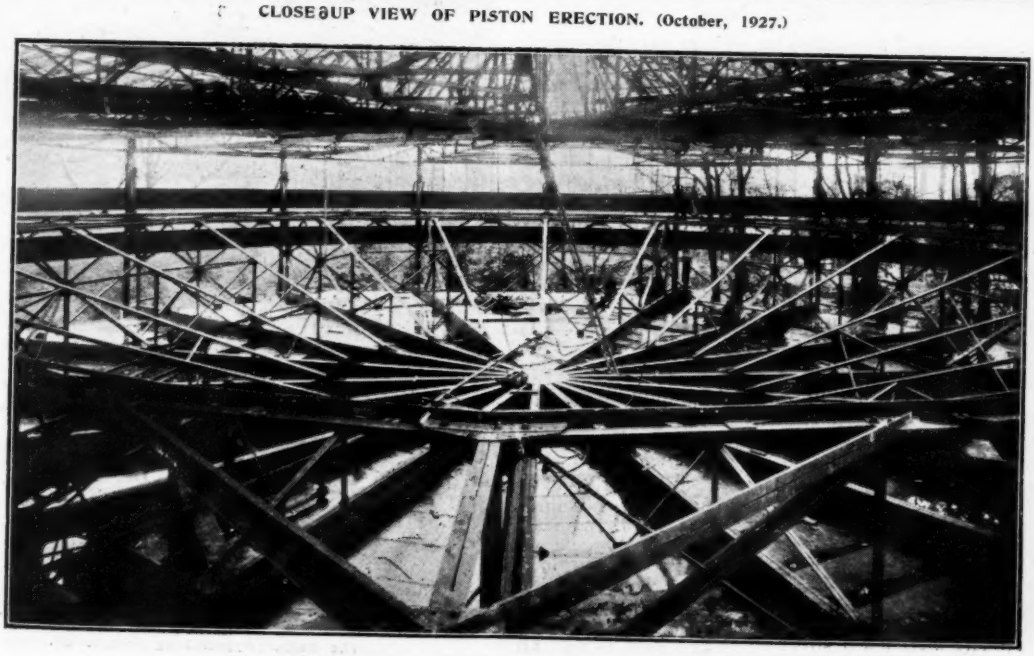
The re-conditioning of the solution is obtained as follows: From a certain point on the system a relatively very small flow is taken off and run over cast-iron pipes, through which is passing the exhaust steam from the pumps. Although, as stated, this flow is very small, it is by this means concentrated to a very considerable degree; and the adjustments are made so that the quantity of water thus expelled per day is sufficient to retain the average concentration of the bulk. By operating on such a small flow for the re-concentration, the acquisition



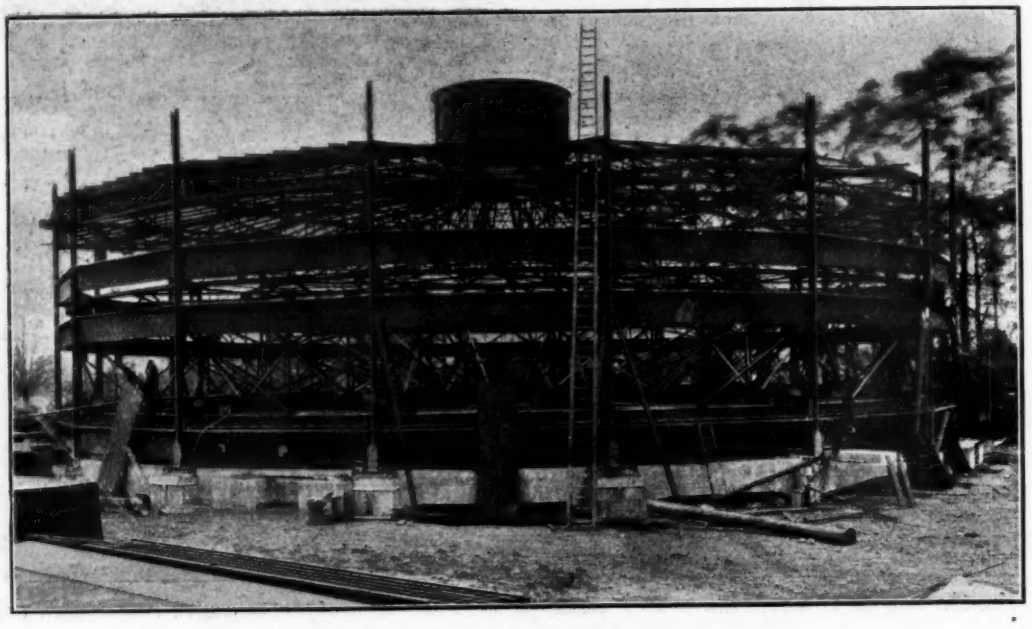
THE WATERLESS HOLDER IS SUPPORTED UPON A COMBINED MASS AND REINFORCED CONCRETE FOUNDATION. (May, 1927.)



CLOSE-UP VIEW OF PISTON ERECTION. (October, 1927.)



ANOTHER VIEW DURING ERECTION. (November, 1927.)



SHOWING THE METHOD OF CONSTRUCTION.

of heat thus necessarily incurred is kept to a negligible figure. A stand-by pump is supplied, and other accessories include a screen for the liquid to prevent foreign matter getting into the circuit. Plants on the same principle are now in course of construction for other gas undertakings.

In a booklet prepared for the occasion of the visit, the following further information relating to the plant appeared: A solution of calcium chloride is circulated through the tower at a present rate of 1200 gallons per hour. The temperature of the solution can be controlled by a cooler consisting of 64 pipes 2¼ in. outside diameter and 12 ft. long, over which water is dripped. The solution in circulation, amounting to some 1500 gallons, is stored in an underground tank 6 ft. in diameter and 18 ft. long. The water extracted from the gas dilutes the circulating solution, and is removed by passing it over an evaporator for a few hours each night until the strength of the solution is restored to 71° to 77° Tw. (36 to 38·5 p.ct. $CaCl_2$), depending upon the atmospheric temperature. The solution strength before evaporation falls below these figures about 0·5 p.ct. $CaCl_2$ with gas of inlet dew-point 45° Fahr. and outlet 26° Fahr. Under these conditions 25 gallons of water are removed from each 1 million c.ft. of gas. The evaporator consists of 12 cast-iron pipes 2 in. internal diameter and 6 ft. long. Exhaust steam passes through the pipes, and the solution is passed in a thin layer over their outer surfaces. The dew-point of the gas is obtained by a double cross wet and dry bulb hygrometer; the values being checked gravimetrically.

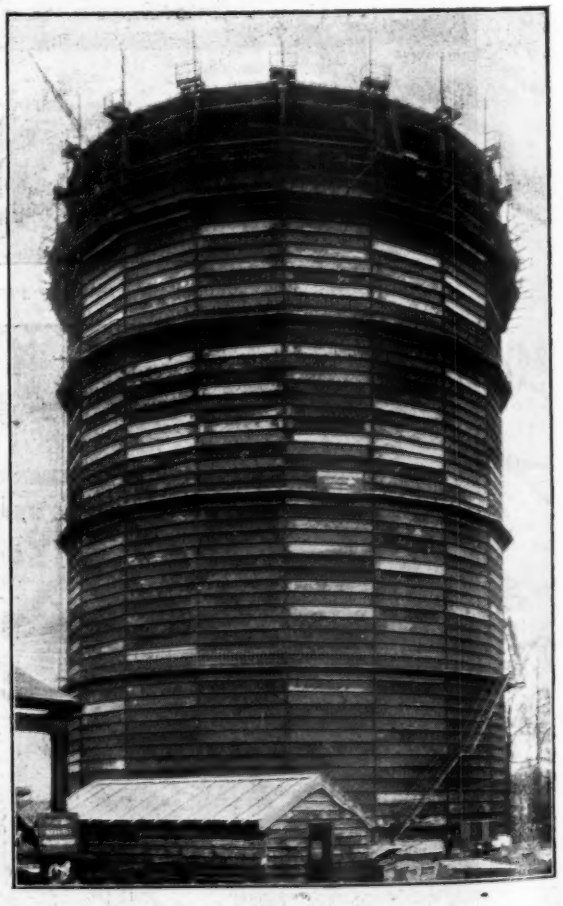
The Governor's Welcome.

After the inspection of the works, the visitors were the guests of the Gas Light and Coke Company at tea, which was served at the well-known Bridge House Hotel. Here they were welcomed by Sir David Milne-Watson (the Governor), who had journeyed down from town for that special purpose.

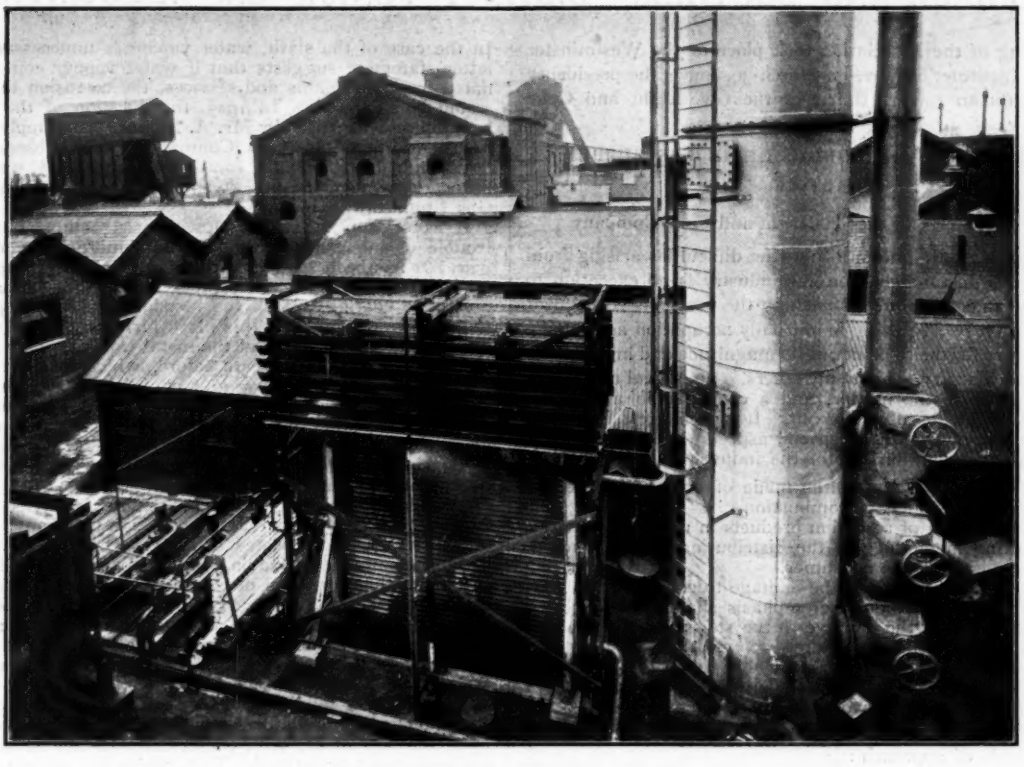
Sir David Milne-Watson expressed his regret that business engagements elsewhere had prevented him from coming down earlier to show the visitors round the works. He was very glad indeed to see so large a number present. The waterless holder they had inspected was quite a novelty in that part of the world, though it was not the first to be erected in this country. That honour had fallen to the Ipswich Gas Company, of which Mr. Henry Woodall (the Deputy-Governor of the Gas Light and Coke Company) was Chairman. He hoped they had been interested in what they had seen that afternoon. It seemed to him they must have been, for he was told that no less than 50 p.ct. of them had reached the top of the waterless holder, which meant a climb of some 190 steps. They must, on so clear an afternoon, have had a very fine view from the top. The question which he understood was exercising the minds of the inhabitants was whether they would enjoy the view from the bottom. [Laughter.] However, he really did not think—and he desired to be quite fair—that it was a disfigurement of the landscape. Viewed in the evening, he felt they would agree that it was not at all unsightly. In fact, it rather reminded one of some great mediæval tower; and he hoped it would not be found to interfere with the amenities of so beautiful a stretch of the river. At any rate, the Company would do all in their power to prevent this. They were going to paint it a colour which would make it as pleasing to the eye as it was possible for any mechanical structure of that kind to be. Of course, people lived in a mechanical age to-day; and one could not stand in the way of progress. All that could be done was to make things harmonize as far as possible with their surroundings.

It had afforded him gratification to learn of the successful meeting the Institution had held that morning, and was only sorry that it had been impossible for him to be present. He hoped that in due course they would obtain their Royal Charter, and thus start an era of new prosperity for The Institution of Gas Engineers. [Applause.]

The President said that on behalf of the members of the Institution present, he desired to thank Sir David Milne-Watson

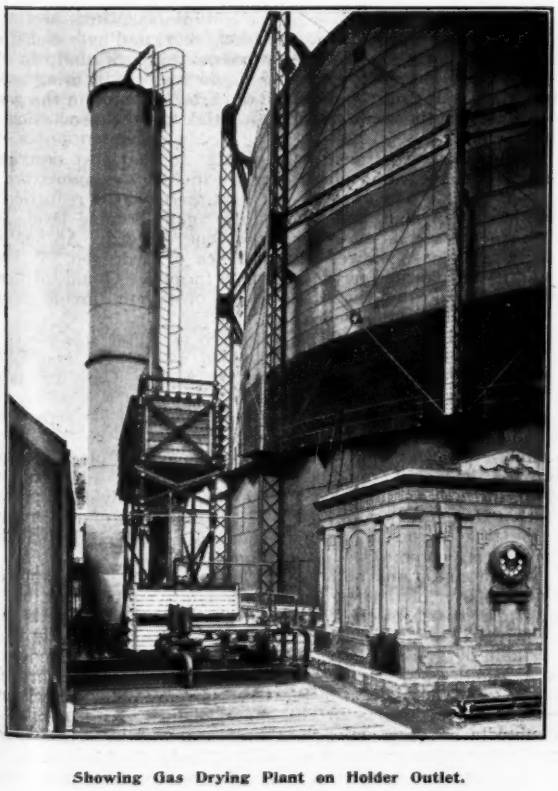


The Holder Approaching Completion.

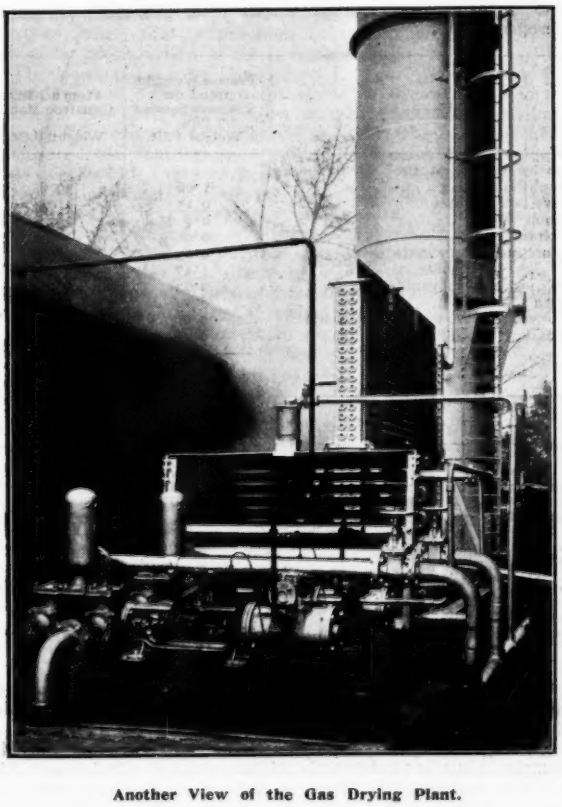


GAS DRYING PLANT AT STAINES.

and the Directors of the Gas Light and Coke Company for a most interesting afternoon, and for the hospitality that had been extended to them. ["Hear, hear."] Few of them had seen a tankless holder before; and if 50 p.c. of the visitors climbed to the top, he could assure the Governor that 100 p.c. looked in through the manhole at the bottom. [Laughter.] The holder had thoughtfully been lighted up internally, so that everyone could see exactly what the structure was. The gas drying plant had also proved of great interest; for many of them had not seen this process before. The Gas Light and Coke Company were always in the forefront of development; and more than that, they invariably turned to the Institution, and gave the members the privilege of learning what was being done. Personally, he was a great believer in the progress of the gas industry, which he regarded as being only at the beginning of its career; but it was essential for them to keep fully abreast of all technical developments. He wished also to thank the members of the Company's staff for the manner in which they had supplied information and looked after the comfort of the visitors. [Applause.]



Showing Gas Drying Plant on Holder Outlet.



Another View of the Gas Drying Plant.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association took place at the Westminster Technical Institute, S.W. 1, on March 30, under the presidency of Mr. LEONARD LACEY, B.Sc., of the Gas Light and Coke Company.

SOME ASPECTS OF CORROSION IN GAS SUPPLY PRACTICE.

By F. C. SMITH, of the Gas Light and Coke Company.

Few industries are immune from the difficulties arising from corrosion. Unfortunately, the gas industry is no exception to the general rule. We are all meeting the problems consequent upon corrosion so frequently in our daily occupation as to make it unnecessary for me to point out its magnitude and importance.

In the gas industry, as in many others, a great deal of thought has been given to the matter, and a considerable amount of research work has been carried out. It is of interest, however, to state briefly a few of the special aspects of the problem as it affects the distribution side of the industry:

(1) The corrosion of apparatus made of brass or copper by the moist products of combustion.
(2) The formation of corrosion products in mains or services, resulting in damage to the distributing system and inconvenience to the consumer.
(3) Closely allied to this is the damage to condensing stoves. Here, in my opinion, the emphasis should not be placed so much upon the damage to the stove as upon the fact that bad combustion is likely to result.
(4) External corrosion of mains.
(5) The corrosion of flue pipe equipment.
(6) Electrolytic corrosion of mains and meters.

When faced with a particular corrosion problem, there are three methods of approach:

(1) The removal of the agent responsible for the corrosion.
(2) The selection of material with the maximum resistance to the particular agent of corrosion.
(3) Prevention of corrosion by suitable protective coatings.

Where possible, the most effective means is undoubtedly the removal of the corrosive agent.

INTERNAL CORROSION OF MAINS AND SERVICES.

Many here this evening will be familiar with the trouble occasioned by oxide of iron deposits in mains and services. This trouble, while well known before the war, appears to have been more prevalent since the war. It is interesting to refer to a report of the "Life of Gas Meters Joint Committee" of the Institution of Gas Engineers, presented on June 1, 1920, by Mr. J. G. Taplay. In this report, a series of analyses of these deposits is given. The following are abstracted for reference:

—	From a Wrought-Iron Low-Pressure Service Pipe. Weight P.Ct.	From a 4-In. Cast-Iron Main. Weight P.Ct.
Loss on drying at 100° C., including naphthalene	1·06	39·8
Heavy tarry matter	0·15	4·0
Carbon	0·0	2·24
Sulphur	0·0	3·0
Ammonium thiocyanate	0·15	0·0
" sulphate	1·17	0·4
" ferrocyanide	0·23	0·0
Ferric "	6·74	2·50
" oxide and triferric tetroxide	90·0	42·70
Silica	0·05	4·96
	99·55	99·55

Analysis of Syphon Liquor from High Pressure Main.

—	Grains per Gallon.
Ammonia	173·0
Ammonium cyanide	0·0
" ferrocyanide	0 0
" thiocyanate	284·5
" sulphide	19·1
" sulphate	51·6
Ferrous "	0·0
Carbon dioxide	341·1
Ferric thiocyanate	absent

I have on many occasions analyzed samples of these deposits; and the results in general are similar to those obtained by Mr. Taplay.

Quoting from Mr. Taplay: "Internal corrosion may be brought about in at least six different ways, as shown. *The first five processes are active in the presence of water vapour.* In the case of the sixth, water vapour is unnecessary." This latter statement suggests that if water vapour could be eliminated from the mains and services, the corrosion taking place would be negligible. In 1923, the question of the quality of iron piping was raised by Mr. A. Stokes (Gas Supply Manager, South Metropolitan Gas Company), and subsequently the "Wrought-Iron Tubing Inquiry Committee" was formed. A report of this Committee was presented to the Institution of Gas Engineers in 1925.

It would appear, as has already been pointed out, that the trouble of internal corrosion became more acute during the war. It has been suggested that the black tarry deposit found on the internal surfaces of pipes before the war acted as a protective coating. With the "stripping" of the gas during the war period, much of this black tarry coating was removed, leaving the clean surface of the metal exposed ready for attack. Some pipes laid many years before, which had not been used during the war period, were seen by me. A skin of black material was observed over the whole of the internal surface. The pipes appeared to have been perfectly protected by oily substances deposited by the gas. This latter fact is mentioned as it may in some way account for this aspect of corrosion having become more acute since the war.

I would like to refer to some experiments carried out in the Laboratories of the Gas Light and Coke Company, the results of which were incorporated in the report of the Wrought-Iron Tubing Committee. Having regard to the generally accepted statement that corrosion of iron does not occur (except in very special cases) in the absence of liquid water, a number of specimens of tubing were taken, the outer surface was removed in order to expose the bright surface of the metal, and a mixture of carbon dioxide and oxygen maintained at a temperature above the dew-point allowed to pass over the specimens for a considerable period. As far as could be seen, there was no evidence of corrosion. A little water vapour was then allowed to condense upon the specimens, with the result that almost immediately oxide of iron was formed. This, and many other experiments in which the carbon dioxide and oxygen mixture was replaced by town gas, seem to justify the statement that corrosion of iron tubing does not occur in the absence of liquid water.

Three other experiments are of interest. The apparatus shown in fig. 1 was set up. Bottles A and B are of equal capacity. Some 50 c.c. of air-free distilled water was placed in each bottle. The specimen of metal to be examined was placed in bottle A, and immersed in the distilled water. The whole apparatus was then swept out with pure oxygen. The oxygen was free from carbon dioxide. The cocks at D, C, and E were then closed. The **U**-gauge had been previously filled with mercury. The function of bottle B is temperature compensation. It is assumed that the gas in both bottles will be subjected to similar changes of temperature, and the effect of differences of pressure on the gauge will be equal and opposite. If corrosion of the metal takes place in A, hydrated ferric oxide will be formed. This will involve an absorption of the oxygen in A, and in consequence a diminished pressure in A. This diminished pressure did, in fact, occur, and hydrated ferric oxide was formed. This experiment suggests that, in the case of iron barrel, oxygen and liquid water will bring about corrosion, and that the presence of carbon dioxide in the gases contained in the main is not essential for the production of iron oxide.

The second experiment was similar to that just described, except that the atmosphere over the metal was a mixture of carbon dioxide and oxygen. At first there was a reduction of pressure in A, but later the gauge again became level, and subsequently an increased pressure was recorded. An analysis of the gas in A showed the presence of hydrogen. A large quantity of hydrated ferric oxide was formed. Quantitative experiments indicated that the presence of carbon dioxide greatly accelerated the rate of corrosion.

In the third experiment, a specimen of metal was placed in a bottle covered with air-free distilled water. An atmosphere of carbon dioxide was placed over the water. Care was taken to exclude any oxygen from the bottle. This was allowed to stand for several weeks. The liquid remained perfectly clear. Bubbles of gas could be seen rising from the surface of the metal, indicating that some action was taking place. On removing the liquid from the bottle, and allowing same to stand with the surface exposed to the air, finely-divided hydrated ferric oxide was precipitated. The explanation of this appears to be that ferrous bicarbonate had been formed, and at that concentration remained in solution.

In the conditions obtained in the gas main, it is apparent that the iron of the ferrous bicarbonate would be precipitated by the presence of the oxygen in the gas. Experiments have shown that the finely-divided oxide thus formed is easily transportable by gas moving at velocities commonly experienced in mains and services. It would thus be carried forward and build up an obstruction in the service at any point of resistance —such as an elbow. This finely-divided oxide would undoubtedly be very active in the presence of hydrocyanic acid and other agents referred to by Mr. Taplay in his report.

On occasions, samples of syphon liquor have been drawn from

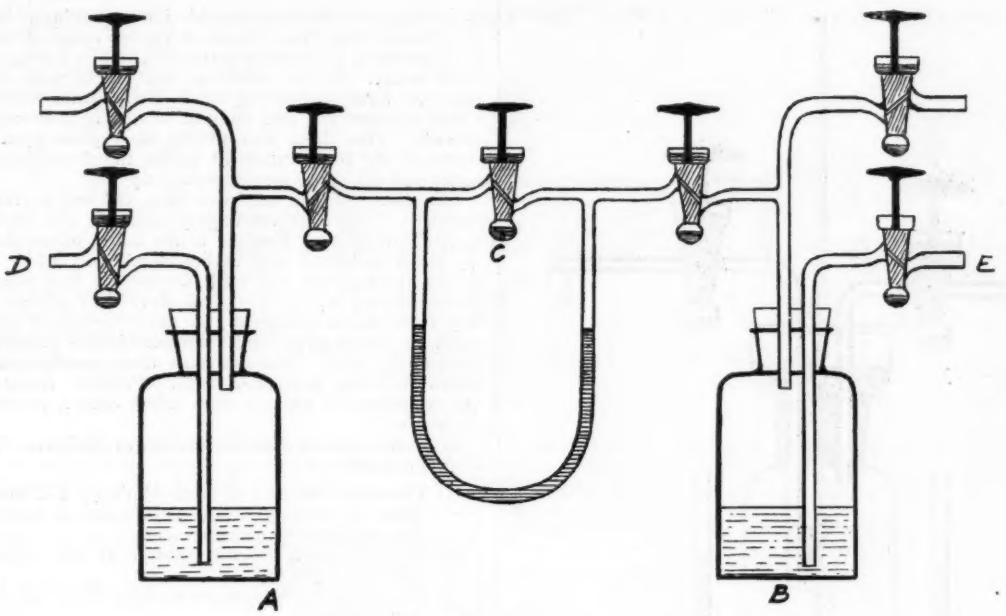


Fig. 1.

high-pressure mains, rapidly filtered, and allowed to stand in contact with air. Very finely-divided hydrated ferric oxide was precipitated upon standing—thus indicating that ferrous bicarbonate can be formed in mains, and will remain in solution if insufficient oxygen is present to precipitate the bicarbonate.

Referring again to the best method of dealing with corrosion problems—viz. (*a*) the removal of the agent of corrosion—the primary agents of corrosion are undoubtedly oxygen and carbon dioxide in the presence of *liquid* water. Both oxygen and carbon dioxide are harmless in the absence of water. Condition (*a*) would be satisfied by the removal of water. As is well known, many companies are drying the gas with this object in view.

As a second expedient, a great deal of trouble occasioned by the stoppages in services could be eliminated if the oxygen of the gas was removed. The ferrous bicarbonate which gives rise to the readily transportable oxide would then be retained in solution in the absence of oxygen.

These statements here have been connected with the elimination of the corrosive agent. For many reasons, time must elapse before all undertakings, even if it were considered advisable, can strip the gas of water or oxygen. We are, therefore, forced back upon the second consideration—viz., the selection of pipes made of material offering the greatest resistance to the agents of corrosion.

The Wrought-Iron Tubing Committee has decided that wrought iron is superior to steel. The specification of this Committee is well known, and the majority of undertakings are buying in accordance with this. The important clause from the corrosion point of view is the percentage of sulphur and manganese allowable.

Sulphur must not exceed	0·03 p.ct.
Manganese ,, ,, ,, ...	0·15 ,,

In regard to protective coatings, this cannot be dealt with within the scope of this paper, but in general it would appear that the coating, to be effective, should prevent the passage of liquid water to the pipe.

The foregoing considerations have led me to seek a method for the rapid measurement of the rate of corrosion of gas barrel when the corrosive agent is water saturated with carbon dioxide. Determinations of the rate of corrosion usually involve one of two things: The extension of the experiments over long periods of time, or the adoption of abnormal conditions in order to attain the results quickly.

The usual proceeding is to place the metal to be tested into the corrosive agent, and to note the appearance of the surface, &c. The change in weight of the specimen is often taken as a measure of the corrosion. In the case of iron and steel, this method usually involves the removal of the rust by mechanical means, and the subsequent estimation of the iron thus removed. This has obvious difficulties and disadvantages. The method about to be described has been investigated, and has promise of being useful for the following reasons:

(1) Comparison of the rate of corrosion between two specimens of iron or steel tubing may be made within the space of a few hours.

(2) All products of corrosion are, it is believed, retained in solution, and therefore no mechanical method of removing the oxide in order to determine the iron content is necessary.

When commencing the investigation, it was hoped to establish a method which could be used for routine examination of deliveries. A method suitable for this must be rapid and simple. It need hardly be pointed out that a method which gives a direct measurement of the rate of corrosion is to be preferred to an analysis of the metal accompanied by microscopic examination, from which one has to make a somewhat difficult deduction. The method under review is rapid, and simple in principle. It has been found necessary to introduce refinements which somewhat limit its application as a routine method. I believe that, with further careful consideration to detail, it may be possible to work-up the method for routine work.

Another aspect which may be considered of value is the opportunity afforded to study the effect of various constituents upon the rate of corrosion. The physical structure must always be considered when examining these results. The reaction upon which the method depends is the formation of soluble ferrous bicarbonate by the action of carbon dioxide on iron in the presence of water.

$$(1)\quad Fe + 2H_2CO_3 = Fe(HCO_3)_2 + H_2.$$

In the gas experiments previously described, it will be remembered that hydrogen was evolved when iron was immersed in (air-free) distilled water with an atmosphere of carbon dioxide above. It will also be remembered that the solution was perfectly colourless until allowed to come into contact with oxygen, when first a greenish coloration was noticed, followed by precipitation of ferric hydroxide.

These reactions were familiar to J. Van Hauer,[1] 1860, who passed carbon dioxide through water in which iron was suspended. He observed the iron was attacked, and attributed this to the formation of $Fe(HCO_3)_2$. Herbert J. Smith[2] investigated the equilibrium condition of ferrous carbonate, ferrous bicarbonate, and carbonic acid. Ferrous carbonate was prepared by reaction of $FeSO_4$ and $NaHCO_3$ solution in the presence of carbon dioxide under pressure. A white precipitate of ferrous carbonate was formed, filtered-off, and dissolved in water saturated by carbon dioxide under 30 atmos. He states that all the iron dissolved was in the form of ferrous bicarbonate. Just and James[3] investigated the rate of oxidation of $Fe(HCO_3)_2$ by mixtures of carbon dioxide and oxygen. This latter reference is of interest in regard to the experiment you have witnessed.

The Apparatus.

The reaction takes place in the specially designed conductivity cell. The cell, which is shown in fig. 2, is placed in one arm of a Kohlrausch bridge, as shown in fig. 3. The current to operate the bridge was obtained from a buzzer working at approximately 50 cycles per second. The specimens of pipe examined were in the form of accurately turned rings. Burnishing was avoided. Oxidation was prevented as far as possible by keeping the specimen under ether. This also had the advantage of removing any grease films. The rings were removed from the ether by means of a glass rod, and placed on the small hook shown in the diagram of cell (fig. 2).

Method of Setting-Up Cell.

The principle upon which determination is based necessitates the exclusion of oxygen gas. This was at first effected in the following manner: A simple cell was partially filled with

(1) J. Van Hauer, "Journal für Praktische Chemie," First series, **81**, 391.
(2) Herbert J. Smith, "Journal of American Chemical Society," 1918, **40**, 879.
(3) Berichte, 1907, **40**, 3965.

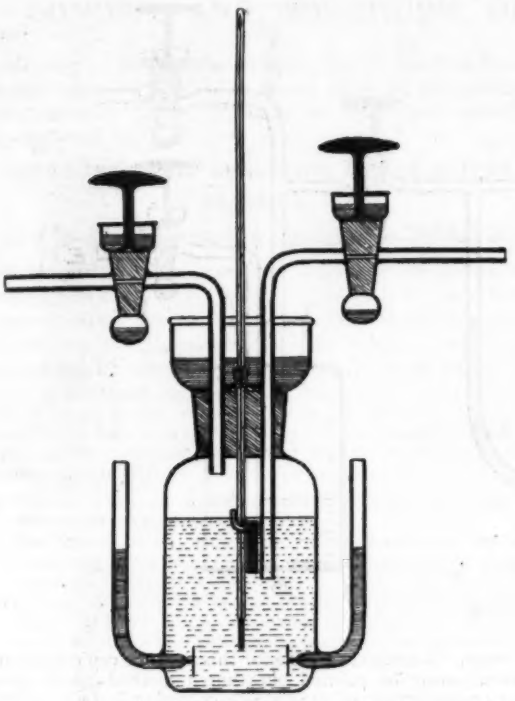


Fig. 2.

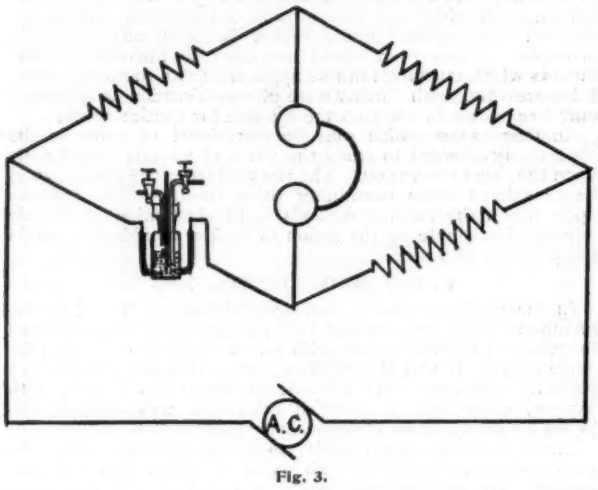


Fig. 3.

distilled water, and boiled for some 5 minutes in order to remove dissolved oxygen. A current of pure carbon dioxide was passed through the water until the temperature of the now carbon-dioxide-saturated water was approximately room temperature. The inlet and outlet of the cell were then sealed. The results obtained by this simple arrangement were promising enough to warrant more thorough investigation of the method.

The disadvantages of the method described for setting-up the cell were as follows:

(1) Initial measurements were delayed owing to the time necessary for the cell to come to atmospheric temperature.
(2) The possibility of the velocity of reaction being affected by the initial high temperature.
(3) The conductivity of an electrolyte varies considerably with temperature. It was decided to work at approximately 24° C. This temperature was chosen, to be as near normal conditions as was consistent with accurate temperature control.
(4) Originally it was thought that good laboratory distilled water would have been suitable for use in the cell for this class of work, but the conductivity of this water was found to be too variable. In consequence, the water was re-distilled in the presence of potassium permanganate through a glass still. The conductivity of water obtained in this way was of the order 5×10^{-6} reciprocal ohms. Water having conductivity of this order was used in the work, as soon as the need was recognized.

In order to overcome the objection mentioned under (1) and (2), the train of apparatus shown in fig. 4 was fitted up.

The carbon dioxide used was supplied in cylinders, and was led into the glass gasholder. The gas was purified from oxygen by passing over acid cuprous chloride containing a copper spiral. Acid fumes were then removed (*a*) by magnesium carbonate in suspension, (*b*) sodium carbonate, and a Liebig bulb of distilled water. At the outlet of the Liebig bulb was a Jena 1500 c.c. flask, containing conductivity water which had been boiled to expel air, and allowed to cool in a stream of carbon dioxide. This flask was placed in a glass tank containing water at the temperature at which the determination was to be carried out—viz., approximately 24° C.

The filling of the cell was then effected in the following manner: The cell, thoroughly cleaned, and containing the specimen ring, was attached to the outlet of the flask containing water saturated with carbon dioxide. Carbon dioxide was passed through the cell until all the air had been displaced. Approximately 14 litres of gas were thus passed. The two-way cock was next turned, so that the carbon dioxide water could be forced over, under carbon dioxide pressure, into the conductivity cell. The cell was then quickly placed in the thermostatically controlled bath. Periodic measurements of the resistance of the cell were taken over a period of five or six hours.

The cell used was made by Muller, of Holborn. The features of this cell are:

(1) The electrodes are of stout platinum foil sealed into the sides of the apparatus, as is common practice in cells for conductivity measurements.
(2) Mercury-sealed ground glass joints and cocks render the apparatus gas-tight.
(3) The specimen is kept in position by suspension from a small hook.
(4) As is common practice, the electrodes are coated with platinum black, in order to prevent interference by polarization effects.

Before proceeding far with the work, it was thought necessary to establish definitely that the fall in resistance of the cell was due to the reaction between carbon dioxide, water, and iron. Accordingly, measurements were made under the following conditions:

(*a*) With the specimen immersed in oxygen-free distilled water saturated with nitrogen gas.
(*b*) With the cell containing carbon dioxide and water only.

In the case of (*a*), the initial resistance was 3230 ohms (temperature, 19° C). After 45 hours, the resistance of the cell was 3160 ohms at 20° C. If the recognized correction—2 p.ct. per 1° C. rise—be applied, it will be noted that, within the limits of accuracy of the experiment, the resistance of the cell may be regarded as constant over the period. In regard to (*b*), more detailed results are available, and are as follows:

Time in Hours.	Resistance of Cell in Ohms.	Temperature of Cell.
		Deg. C.
0·0	..	21·0
0·5	9440	23·6
1·1	9330	23·8
1·4	9400	23·9
1·8	9360	24·0
2·7	9440	23·8
3·1	9450	23·8
3·8	9450	23·7
7·1	9460	23·8
23·5	9470	23·7

It is thus conclusive that the resistance of the cell remained constant under these conditions. This important result has been confirmed. In general, therefore, it appears safe to conclude that the fall in resistance of a cell when iron is immersed in water saturated by carbon dioxide is due only to the reaction between the iron and carbonic acid.

EFFECT OF THE ADMISSION OF OXYGEN INTO CELL UPON RESISTANCE.

During the preliminary work, a cell was set-up and resistance measurements were taken. After approximately 69 hours, a brownish deposit of ferric hydroxide was noticed, due without doubt to a slight leakage of oxygen into the cell. The measurements were continued, and the results are as follows:

Time in Hours.	Resistance of Cell in Ohms.
3·0	15,300
4·3	14,500
20·6	9,020
23·6	8,930
69·0	5,550
75·0	5,000
92·0	5,850
100·0	5,850
117·0	6,140
125·0	6,000
141·0	6,800

These results appear to be consistent with the idea of the mechanism of the reaction. The fall in resistance is quite normal up to 69 hours. After 69 hours, ferric hydroxide was

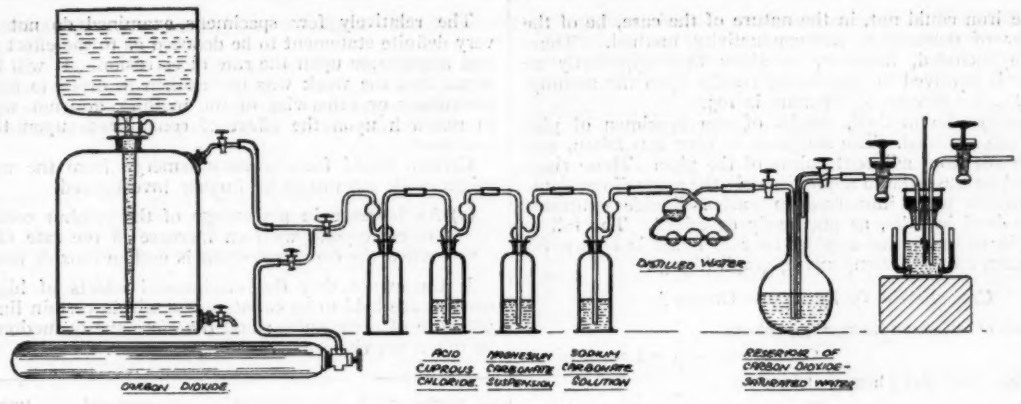


Fig. 4.

observed to be precipitated, due undoubtedly to the leakage of oxygen into the cell. This would precipitate some of the $Fe(HCO_3)_2$ in accordance with the following reaction:

$$4Fe(HCO_3)_2 + O_2 + 2H_2O = 4Fe(OH)_3 + 8CO_2$$

After the admission of oxygen, it is probable that the ferrous bicarbonate which continued to be formed was precipitated by the admission of oxygen, and thus the resistance did not continue to fall normally. This is a point which appears to be worthy of further investigation.

Basis of Calculation.

For the benefit of those who may be somewhat unfamiliar with the theory of conductivity methods, the basis of calculation has been stated in some detail. The resistance of a conductor is given by the general formula:

$$R = \frac{L\rho}{A} \text{ where } R = \text{Resistance.}$$

ρ = Specific resistance.
L = length, A = Area of cross-section of conductor.

$$\text{Hence } \rho = \frac{RA}{L}.$$

Reciprocal resistance, or conductance

$$= \frac{I}{R}.$$

Reciprocal specific resistance, or specific conductance

$$K = \frac{I}{\rho} = \frac{L}{RA},$$

$$\text{and } R = \frac{L}{KA}.$$

Now, $\frac{L}{A}$ is constant for any cell, and is known as the cell constant C.

$$\therefore C = \frac{L}{A}.$$

$$\text{Hence } R = \frac{C}{K}.$$

Now, in the method under review R is measurable, and C can be determined.

Determination of C.

The determination of C involves placing a liquid of known specific conductivity into the cell and measuring R, whence C can be calculated. Kohlrausch has determined K for the solutions of many salts at varying dilutions. For the purpose of determining C, a solution of N/100 KCL at 23·7° C. was used. The specific conductivity of this solution at 23·7° C. is 0·001379 reciprocal ohm. As an example, the resistance of a given cell was found to be 374 ohms at 23·7° C.

$$\text{Thus } R = \frac{C}{K}$$

$$374 = \frac{C}{0{\cdot}001379}$$

$$\therefore C = 0{\cdot}515.$$

Conductance of Solutions.

The conductivity of a solution is dependent upon its concentration. Equivalent conductance (usually denoted by Λ) $= \frac{K}{\eta}$. Where η is the concentration expressed in gramme equivalents per c.c. Thus for KCl 74·55 gms. (1 gramme equivalent) dissolved in 100 litres of water gives a value for η of 10^{-5}.

$$\therefore \Lambda \text{ for KCl at } 23{\cdot}7^\circ \text{ C.} = \frac{0{\cdot}001379}{10^{-5}}$$

$$= 137{\cdot}9$$

$$\text{Now since } \Lambda = \frac{K}{\eta} \text{ and } R = \frac{C}{K}$$

R can be measured, C has been evaluated. Thence K may be calculated.

Now, Λ_∞ for any given salt may be obtained theoretically from consideration of ionic mobilities, or practically by measuring the conductivity of a solution of known strength in a cell of known constant and extrapolating the results.

The mobility of the HCO_3 ion is difficult of direct evaluation. Theory seemed to suggest that no great error would be involved by using the value of the mobility of the carbonate ion.

Thus equivalent conductance

Λ_∞ for ferrous carbonate.
45 + 60
Mobility of ferrous ion. Mobility of carbonate ion.

$\therefore \Lambda_\infty$ for ferrous carbonate = 105

In order to ascertain if this assumption is reasonable, two cells were set-up containing a specimen iron ring immersed in water with an atmosphere of carbon dioxide. These cells were allowed to stand for 24 hours, and the iron in solution was carefully determined.

$$\text{Now, } \Lambda = \frac{K}{\eta}$$

Case 1, cell A (after 21 hours):
Weight of Fe in solution . . . . . = 0·0125 gm.
" " $Fe(HCO_3)_2$ . . . . . = 0·0398 gm.

$$\text{Concentration in gramme equivalents per c.c.} = \eta = \frac{0{\cdot}0398 \times 2}{205 \times 178}$$

Where 205 is volume of solution in c.c., 178 is molecular weight of $Fe(HCO_3)_2$, and $\frac{178}{2}$ is gramme equivalent.

Whence $\eta = 0{\cdot}218 \times 10^{-5}$.
Now, K = fall in conductance × cell constant.
$= 3{\cdot}5 \times 10^{-4} \times 0{\cdot}515.$
$= 1{\cdot}8 \times 10^{-4}.$

$$\text{Whence } \Lambda = \frac{K}{\eta}.$$

$$\therefore \Lambda = \frac{1{\cdot}8 \times 10^{-4}}{0{\cdot}218 \times 10^{-5}}.$$

$$= 82{\cdot}5.$$

The second cell after 22 hours gave a value for Λ_∞ of 83·8.

It must be remembered that these determinations were not made on pure iron, and the chemical method used for deter-

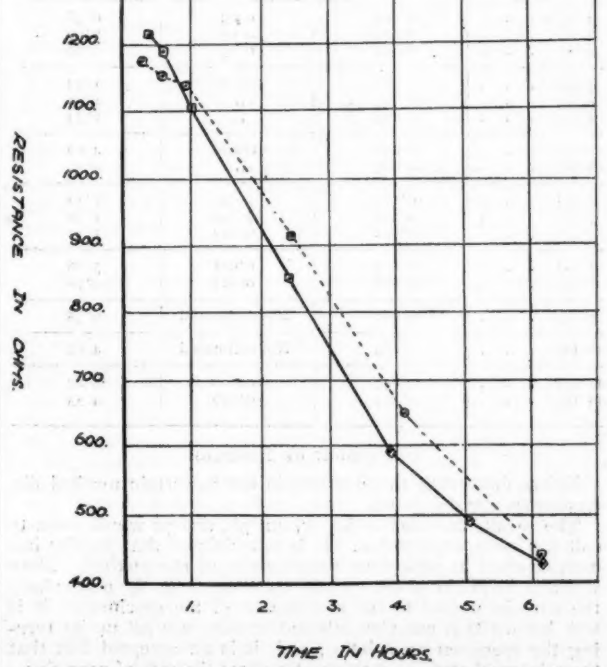


Fig. 5.

mining the iron could not, in the nature of the case, be of the same order of delicacy as the conductivity method. These results are included, however, to show that apparently no great error is involved in calculating results upon the assumption that Λ_∞ for ferrous bicarbonate is 105.

To illustrate the method, details of one specimen of pipe examined are recorded. The specimen of pipe was taken, and rings were cut from adjacent points of the pipe. These rings were turned on the lathe to approximately the same dimensions. The specimens were immersed in carbon-dioxide saturated water contained in cells, as previously described. The fall in resistance in ohms plotted against time in hours is shown for each specimen on the accompanying graph (fig. 5).

CALCULATION OF RESULTS.—CURVE A.

Resistance of cell after 2 hours = 9950 ohms

$$\text{Conductance} = \frac{I}{R} = 1{\cdot}004 \times 10^{-4}$$

Resistance of cell after 3 hours = 8300 ohms

$$\text{Conductance} = \frac{I}{R} = 1{\cdot}205 \times 10^{-4}$$

Increment in conductance in 1 hour $= (1{\cdot}205 - 1{\cdot}004)10^{-4}$
$= 0{\cdot}201 \times 10^{-4}$

Now, $= \frac{K}{\Lambda}$ and $K = \frac{I}{R} \times$ cell constant

$K = 0{\cdot}201 \times 10^{-4} \times 0{\cdot}484$
$= 0{\cdot}0973 \times 10^{-4}$

Thus $\eta = \frac{0{\cdot}0973 \times 10^{-4}}{105}$
$= 0{\cdot}9265 \times 10^{-7}$ gm. equivalents per c.c.

Now equivalent weight of $Fe(HCO_3)_2 = \frac{178}{2}$

and vol. of solution in cell $= 209$ c.c.

quantity of $Fe(HCO_3)_2$ per c.c. $= 0{\cdot}9265 \times 10^{-7} \times \frac{178}{2}$

Total weight of $Fe(HCO_3)_2$ $= 0{\cdot}9265 \times 10^{-7} \times \frac{178}{2} \times 209$
$= 1{\cdot}723 \times 10^{-3}$

Weight of Fe removed in 1 hour $= \frac{1{\cdot}723 \times 10^{-3}}{178} \times 56$
$= 0{\cdot}5422 \times 10^{-3}$ gms.

Now, area of surface of ring $= 13{\cdot}3$ sq. cms.
So that weight of iron removed per
100 sq. cm. per hour $= \frac{0{\cdot}5422 \times 10^{-3} \times 100}{13{\cdot}3}$ gms.
$= 4{\cdot}07 \times 10^{-3}$ gms.

The result obtained from the second cell was $4{\cdot}57 \times 10^{-3}$.

Several specimens of barrel have been examined in the way described, and the results are recorded.

Number of Specimen.	Analysis of Metal.		Milligrams of Iron per 100 Sq. Cm. of Surface Removed per Hour
	Percentage of Sulphur.	Percentage of Manganese.	
1 (*a*)	0·052	0·39	3·99
1 (*b*)	0·052	0·39	4·12
2 (*a*)	0·012	0·30	0·46
2 (*b*)	0·012	0·30	0·68
3 (*a*)	0·029	trace	2·37
3 (*b*)	0·029	,,	2·83
3 (*c*)	0·029	,,	1·38
4 (*a*)	0·028	0·03	0·56
4 (*b*)	0·028	0·03	2·66
4 (*c*)	0·028	0·03	2·90
5 (*a*)	0·029	trace	1·92
5 (*b*)	0·029	,,	1·25
5 (*c*)	0·029	,,	2·33
6 (*a*)	0·015	trace	4·08
6 (*b*)	0·015	,,	4·57
7 (*a*)	0·012	0·022	2·14
7 (*b*)	0·012	0·022	1·70
7 (*c*)	0·012	0·022	1·12
8 (*a*)	0·029	0·021	5·18
8 (*b*)	0·029	0·021	4·78
9 (*a*)	0·068	Not estimated	6·38
10 (*a*)	0·059	Not estimated	4·62
11 (*a*)	0·044	0·016	4·27
11 (*b*)	0·044	0·016	4·35

DISCUSSION OF RESULTS.

Before discussing these results in detail, certain marked discrepancies can be noted.

The results recorded under 3*c*, 4*a*, 5*b*, and 7*c* would seem to call for some explanation. It is not claimed that finality has been reached in regard to some details of the method. More work is required upon certain aspects. This is particularly the case in regard to the preparation of the specimen. It is well known that complex internal stresses are set up by turning the specimen on a lathe; and it is an accepted fact that these internal stresses may greatly affect the rate of corrosion.

The relatively few specimens examined do not allow any very definite statement to be deduced as to the effect of sulphur and manganese upon the rate of corrosion. It will be remembered that the work was undertaken in order to establish the usefulness or otherwise of the method, and not with a view to research upon the effect of constituents upon the rate of corrosion.

Certain broad facts seem to emerge from the work which might with advantage be further investigated.

(1) An increase in percentage of the sulphur content seems to correspond with an increase in the rate of corrosion when the corrosive agent is carbon dioxide and water.

I am aware that the detrimental effects of high sulphur content are held to be counteracted within certain limits by the presence of manganese; and therefore the deduction must not be taken too rigorously.

Number of Specimen.	Percentage of Sulphur.	Percentage of Manganese.	Average Rate of Corrosion.
2	0·012	0·30	0·57
7	0·012	0·022	1·65
6	0·015	trace	4·32
4	0·028	0·03	2·78
3	0·028	trace	2·19
5	0·029	,,	1·83
8	0·029	0·021	4·98
11	0·044	0·016	4·31
1	0·052	0·39	4·06
10	0·059	Not estimated	4·62
9	0·068	,,	6·38

In this work, as previously pointed out, it has been assumed that the iron present is in solution as $Fe(HCO_3)_2$. It is probable, however, that a limited quantity of ferrous hydroxide may be formed by hydrolysis, and remain in colloidal form. If this latter statement be a fact, the method adopted for the experimental evaluation of Λ would lead to a low value, and calculations based upon the theoretical value of 105 would result in a lower value for the rate of corrosion. In any case, since experimental evaluation of Λ gives a value of 83, the colloidal ferrous hydroxide appears to constitute only a small proportion of the total iron in solution.

In an earlier part of this paper, the corrosion of brass by the moist products of combustion has been mentioned. Some time ago an ordinary pendant was fitted into a larger brass tube in such a way as to allow a few inches of the pendant to protrude beyond the larger diameter tube at the burner end. A burner was fixed. Connections were made so as to allow of water circulation through the outer tube. The object was to keep the pendant cool just above the burner, in order to condense the water in the products of combustion on this portion of the pendant. The result was as expected. The brass was most vigorously attacked where the water was condensed.

This is just another instance of the importance of liquid water in corrosion problems.

CORROSION OF FLUE PIPE EQUIPMENT.

The corrosion of sheet-iron flue pipes is well known, and all kinds of expedients have been adopted to minimize it. There can be little question that something very similar in character to that responsible for the internal corrosion of mains and services happens in this case; liquid water in the presence of carbon dioxide and oxygen being in the main responsible. Sulphur oxides in the presence of water undoubtedly make the problem more difficult. I have constantly heard the question asked whether galvanized or lead coating or plating with this or that metal will be effective against these agents of corrosion. The answer is that, unless the surface of the metal is absolutely covered with a metal unattacked by these agents, they will not be an effective protection.

What is known as contact corrosion occurs when a metal is in contact with another metal, and both are immersed, or partly immersed, in an electrolyte. This is precisely similar in principle to a galvanic battery. The electrolyte in this case may be regarded as a dilute acid. The following is a table arranged in order of their solution pressures or electrical potentials:

Potassium	(Hydrogen)	Arsenic
Sodium	Aluminium	Copper
Barium	Iron	Tin
Calcium	Cobalt	Mercury
Magnesium	Nickel	Silver
Chromium	Lead	Iron carbide
Manganese	Antimony	Iron oxide
Zinc	Bismuth	

If any two of these metals are in contact with each other, or are connected by a wire and surrounded with a liquid conductor, then the one which precedes the other in the list will be attacked. Thus in the case of a galvanized flue pipe the zinc would be attacked, and this in turn would leave the surface of the iron exposed for attack by the ordinary agents.

I had hoped to include some reference to electrolysis and methods employed in tracing electrical leakages; but this will

have to remain for some future date, owing to the limited time at our disposal.

I should like to record my thanks to the Gas Light and Coke Company for permission to publish work carried out in the Company's laboratories. I also add my appreciation of the co-operation of my colleague, Mr. L. T. Minchin, B.Sc.

Discussion.

The CHAIRMAN said that, as the author's colleague, Mr. Minchin, was present, he would ask him to open the discussion on the paper.

Mr. L. T. MINCHIN, B.Sc. (Gas Light and Coke Company), said he thought that one of the more obvious criticisms to which this method was liable was that the measurements on which the rate of corrosion was based were taken over the first four or five hours—i.e., the initial rate of attack only was measured. It might also be objected that an artificial condition was introduced by excluding oxygen and preventing the precipitation of ferric hydroxide, thereby interfering with the natural course of the reaction. It might, however, be reasonably assumed that in actual practice the oxidation of the ferrous bicarbonate proceeded independently of the primary corrosion effects—viz., the formation of ferrous bicarbonate and hydrogen from iron and carbonic acid—which was therefore the determining factor in corrosion. Furthermore, since the ferrous bicarbonate formed was continually being removed, it was the *initial* rate of attack upon which the life of the material depended, when subjected to internal corrosion. Mr. Minchin went on to say that the effect of the introduction of oxygen into the cells was of some interest, though it was not yet sufficiently well based on experiment for him to discuss it without some diffidence. A curve was recently plotted of the fall of resistance of one of these cells containing a specimen of iron, the procedure being normal except that a mixture of carbon dioxide and oxygen was periodically passed through. The effect was that at each admission of oxygen an immediate increase in resistance resulted. After the admission of oxygen, extending over about ten minutes, the resistance fell rather more rapidly. This was repeated several times with the same effect. The resultant resistance was approximately the same as it would have been had no oxygen been admitted. This would seem to indicate that the hydroxide formed had been redissolved, but he would be very reluctant to draw any such conclusion until the experiment had been confirmed. It was, however, of great interest to ensure that the primary reaction which they were measuring was the one upon which the ultimate life of the iron depended.

SENSITIVITY OF THE METHOD.

The CHAIRMAN observed that they had listened to a highly interesting paper. The subject-matter, however, was of such a technical nature that it made one diffident to enter into a discussion on it. It seemed to him that the author had endeavoured to convince them that he had arrived at a sensitive laboratory method of determining the resistance to corrosion of different materials. He (the speaker) suggested that the sensitivity of the method might make it difficult to say that a strip of material from a piece of tubing was representative of the whole length. He would like to ask the author what differences were found in a length of tubing, and whether he had compared two samples of tubing as different in nature as they were likely to meet with in practice. The apparatus was most interesting, and the method of demonstration adopted by Mr. Smith highly ingenious. Mr. Lacey concluded his remarks by saying how pleased they were to have Mr. Taplay with them.

INTERNAL AND EXTERNAL CORROSION.

Mr. J. G. TAPLAY said he had listened with great pleasure to the paper delivered by Mr. Smith, as he (the speaker) was keenly interested in the question of corrosion in mains and services, and also in meters. The author—whose work he had observed at Watson House—was, he believed, endeavouring to show that his electrolytic method was suitable for determining the time it took water to percolate through the coverings of pipes; these coverings being adopted by certain manufacturers. He (the speaker) hoped to submit for tests pipes covered with a special material which was at the disposal of the Gas Light and Coke Company. Returning to the question of corrosion, there were, he suggested, two aspects of the problem—internal corrosion and external corrosion. The first depended largely on the amount of water vapour present in connection with carbon dioxide and oxygen. It was known that, if water vapour was absent, corrosion would not take place. External corrosion was dependent not only on the presence of water vapour, but also on the nature of the soil. Calcium bicarbonate, for example, played an important part in the external corrosion of mains and services, especially when these were wrought iron or steel. With cast iron, the effect was not so great. It would be a good thing if they could be assured that mains and services would not be laid in made-up ground which was more or less of an alkaline character. Acid ground would produce corrosion, as had occurred some time ago in Shaftesbury Avenue; but alkaline soil would do the same, corrosion taking place with the formation of hydrogen. The paper was a comprehensive one; and the author had obviously given much thought to the subject. His apparatus gave them a measure of the rapidity of corrosive action. He (the speaker) had found in this method that ammonia was produced from the nitrogen compounds contained in the iron, and also ammonium sulphate, as a result of the combination between the nitrogen and sulphur compounds. The formation of ammonia was more noticeable in the case of steel mains than when wrought-iron mains were employed. With large mains and services, an appreciable quantity of ammonia thus formed might be added to the gas.

QUESTION OF ION DIFFUSION.

Dr. EATON (Gas Light and Coke Company), while congratulating Mr. Smith on his neat method, suggested that it might embody a source of error which was not mentioned in the paper. He took it that the electrodes were positioned at the base of the cell, and were comparatively small. The decrease in the resistance of the cell depended on the concentration of ions between the electrodes, but this was not necessarily the same as the concentration of the ions round the sample. Unless the cell was agitated, it might be that the ion-concentration round the metal under test would be greater than that between the electrodes, for it took time for the ions to diffuse. This fact was exemplified in the classic experiment where a layer of copper sulphate solution was placed in a cylinder below a column of water. It took a number of years for the copper sulphate ions to diffuse upwards and finally result in a uniform solution. If complete mixing did not take place in the cell, then account should be taken of the rate of diffusion of ferrous bicarbonate ions. It was possible, of course, that the rate of evolution of gas in the cell was sufficient to agitate the solution; but he would be pleased to hear Mr. Smith's views on whether this thorough mixing was actually effected.

THE AUTHOR'S REPLY.

Mr. SMITH, replying to the discussion, said that the difficulty mentioned by Mr. Lacey was a very real one. It was by no means easy to obtain a representative sample. The tests outlined were on samples of the ordinary deliveries to Watson House, taken at random. Two adjacent rings were cut from the pipe, and two or three determinations made on each. The method of sampling, of course, was not peculiar to his system of test. He was delighted that Mr. Taplay had come to the meeting, and he thanked him for his remarks. He (the speaker) had avoided speaking on the question of pipe wrappings, because these tests were being carried out for the Institution of Gas Engineers. As Mr. Taplay had mentioned, they were trying to measure the ability of a protective coating to prevent water percolation. The causes of internal and external corrosion were different, but he believed that, if they could get a coating which would prevent liquid from reaching the pipe, they would have gone far to solve the difficulty of external corrosion. However, he had no wish to be dogmatic. Mr. Taplay's remarks on the formation of ammonia were most interesting; and perhaps it would relieve the consciences of gas engineers to find that ammonia in the purified gas might be the result of corrosion. Dr. Eaton had referred to the diffusion of ions. If the liquid in the cell were perfectly still, then Dr. Eaton's criticism would apply; but in their experiments, he thought there was sufficient agitation to ensure thorough mixing.

VOTE OF THANKS.

Mr. J. H. GOLDSMITH (South Suburban Gas Company) proposed a vote of thanks to the author for his paper; and Mr. R. J. PEPPER (Gas Light and Coke Company), in seconding this, suggested that the method evolved by Mr. Smith would doubtless become of increasing importance. There was scope, for instance, in determining the effects of different gases on various materials—work which might lead to surprising results.

Mr. SMITH's reply to the vote terminated the meeting.

Mr. Hay's Southern Association Paper.—Great pressure has unfortunately compelled the holding over until next week of the report of the discussion on Mr. Hay's paper dealing with silica retorts, which took place at the recent meeting of the Southern Association of Gas Engineers and Managers.

Massachusetts Institute of Technology.—As part of the course in Fuel and Gas Engineering at the Massachusetts Institute of Technology, a series of lectures by men who possess special knowledge of important phases of gas manufacture are to be given during April and May. These lectures are as follows: "Coke Oven Construction and Operation," by Mr. D. W. Wilson (Wilputte Oven Corporation); "Purification of Gas," by Dr. F. W. Sperr, Junior (Koppers Company); "Low-Pressure Distribution," by Mr. R. S. Carter (Malden and Melrose Gas Light Company); "High-Pressure Distribution of Gas," by Mr. A. W. Grant, Junior (Koppers Company); and "Handling of Coke and Bye-Products," by Mr. A. M. Beebe (Rochester Gas and Electric Corporation). The course in Fuel and Gas Engineering at the Institute is now in its third year. During the first two years nine graduate engineers completed the work, and they are now employed in various branches of the fuel and gas industries.

Ramsay Memorial Laboratory of Chemical Engineering.—The Chemical Engineering Building and Equipment Fund Committee, of which the Rt. Hon. Sir Alfred Mond, Bart., is Chairman, and Sir David Milne-Watson Hon. Treasurer, recently issued an appeal for a capital sum of £50,000 for the extension of the Ramsay Laboratory of Chemical Engineering at University College, London, and for its equipment. The response up to the present time has produced £23,555. Among the subscribers are: Imperial Chemical Industries, £10,000; Gas Light and Coke Company, £5000; South Metropolitan Gas Company, £105; Colonel Sir Edward Brotherton, £100; and Messrs. Mather & Platt, Ltd., £100. In addition to the capital fund for the building and equipment, an income of £6000 a year is required for the maintenance of the laboratory. Towards this £3191 has already been promised for the first five years, and £2600 for the second five years. The Committee are anxious to complete both funds as speedily as possible, in order that the new building may be proceeded with. Donations and subscriptions may be sent to Sir David Milne-Watson, at University College, London (Gower Street, W.C. 1).

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

ANNUAL MEETING IN GLASGOW, MARCH 31.

NOTES FROM AN ADDRESS ENTITLED "MANUFACTURE AND SALESMANSHIP—AN ESSENTIAL PARTNERSHIP."

By W. M. Mason, Manager, "B.C.G.A."

The increasing number of addresses and speeches on salesmanship make modest men like myself particularly diffident in attempting to undertake an addition to the list; and it was only on receiving a most pressing invitation to address you that I undertook to do so. At the same time, I wish to say how pleased I am to have the opportunity again of speaking to the rising generation of keen gas men in Scotland, as represented by the Western Juniors—particularly as it happened that, more years ago than I like to think, I acted as first Secretary of the organization. It is not without significance that an increasing number of men now holding responsible positions in the industry at home and abroad have been associated with the junior organizations, which form one of the best mediums of practical education.

Scotch folk, with their logical minds, generally like to have a "text" on which to hang their sermons. I do not propose to inflict a sermon upon you, even if I were capable of doing so; but I certainly wish to give you a fine thought on which I will endeavour to hang the main things I have to say to you. This should be of special interest, as many of you are more particularly associated with the works and manufacturing side of the industry than with the sales development side. My text is from a speech by His Royal Highness the Duke of York, at a recent function of the Incorporated Sales Managers' Association in London. I pass it on to you, not because it came from a high and honoured member of society, but because of the inherent value of a business axiom brimful of commonsense:

> Is not manufacture too often considered as most important, more dignified, and needing more skill than selling? Yet surely the man who secures and maintains the markets for the factories' goods is of at least as vital importance as the man who produces them. What is wanted is the best men for both functions, and complete co-operation between them; a complete realization by each of the importance and the difficulties of the other. Supply without demand is of no value; output that cannot be sold profitably is not an asset but a liability; make without marketing spells bankruptcy.

This might be very effectively supplemented by the following from our Executive Chairman, and also by a recently published statement with an American point of view:

> Selling is the end and aim of production. The work of the sales manager is the essential complement to that of the works manager—indeed, it is the condition precedent to his continued employment; for without markets the works of the country must cease to function.
>
> Owing to the economic conditions which have controlled the development of the gas industry, the standard practice of gas companies at the present time is to consolidate all the activities of the company, both producing and selling, under one head. That unity of command is necessary, no man of experience will dispute. One head is better than two—all proverbs to the contrary notwithstanding. But the selection of such a man introduces a problem peculiar to public utility management; for he must be one who can ride successfully two horses at once. In most industries the head is either manufacturer or merchant; in this he must be both. As a result, the practice in the past has been to put a production man at the head of the company, with the result that the business of selling the goods has fallen into a subsidiary position, called the commercial department, headed at best by a good routine subordinate. Manufacture has ruled the roost, when selling should have been supreme; for, as is well known in other industries, if you can get a skilful merchant to sell your goods, you can always hire someone to make them. Selling is the head, and manufacture the hand that serves. And we know that heads are rare, while hands are plenty.

A man's training, which is so often outside his own control, has, inevitably, a tremendous bearing upon his mental outlook. It is only the occasional "super-man" who can get outside of himself, so to speak, and obtain a clear and detached view of where his training—mental and material—is leading him. If a young man has spent most of his life on the works, he will naturally be more keenly interested on the engineering and manufacturing side; and when we remember that the majority of those who are now listening to me have, unquestionably, the ambition "to fill a manager's shoes" one day, and that some of you may indeed fill high places in the industry, it is necessary that you should have your thoughts definitely turned to a side of the industry which is, to put it at not too high a level, at least equal in importance to the manufacturing side. I refer to the salesman's point of view.

Service.

I heard recently a distinguished business man sum-up his ideas of salesmanship in the following terse phrase:

> Study the customer, and show him the need he himself has not discovered.

That may be taken as a modern view of advertising. Some of you may think that before reaching this point a lot has to be done, and I agree with you. What is now known in the industry as good service is not designed to cover a multitude of sins, but rather to indicate a circle of good works, naturally arising from a sincere motive of goodwill, and the policy of the square deal.

Good service must begin in the works; and in this connection the attitude and outlook of the manager will have most to do with the policy of the undertaking. Good service should certainly include:

(1) Regular quality of gas supplied at regular pressure, which includes adequate mains and service pipes.
(2) Active and properly organized maintenance and inspection of appliances schemes, with the conviction that a satisfied and happy customer is one of the best possible advertisements.
(3) Showrooms in the best parts of the area which will compare not unfavourably with the best-grade shops in the district.
(4) Facilities for scrapping old fittings, particularly as regards lighting, and supplying first-class and modern apparatus at lowest possible prices.
(5) Educative publicity by means of the regular distribution of attractive and informative pamphlets dealing with various branches of the business.
(6) Supporting and co-operating with national publicity effort, and supplementing it by local advertising in the many forms now available.

These may be reckoned as quite commonplace sections in the policy of a well-conducted modern gas undertaking; but how many gas undertakings, I wonder, in Scotland, and elsewhere, are endorsing, *in practice*, such an apparently simple and straightforward programme?

A Junior's Mental Outlook.

I wonder what you young men really think about salesmanship and advertising; the consumers' point of view; and all that is included in that convenient phrase I have just referred to, "Good service." Are you sceptical or doubtful in considering and discussing the subject? Are you indifferent, and under the impression that your attitude matters little, as you are on the works side? Perhaps you are frankly hostile, and think, in a superior sort of way, that, *of course*, the scientific or chemical side is the really important side. "The thoughts of youth are long, long thoughts;" and while you are not likely openly to express indifference to the subject, it might be revealing to see behind some of your eyes for a little. That is why I am trying to treat the matter quite seriously.

Some of you may think you have enough to do without bothering with a side of things that the "B.C.G.A." is supposed to look after; but may I suggest that not only will the study of advertising prove fascinating to a degree, but the education and knowledge gained will almost certainly prove beneficial to the man who devotes time to it? One of the most encouraging things which I personally come across in my journeys round the country is the number—and the number is ever increasing—of men (not necessarily the chiefs, who have frequently the heavy end of control and policy to look after) who are as keen as if they were advertising agents on testing and trying-out their own ideas or schemes in local publicity. The Salesmen's Circles and conferences have undoubtedly stimulated interest and thought. The "B.C.G.A." is a national "pool" to which many of these men regularly contribute for the good of the whole, and from which they are glad to draw when occasion demands it. We in the gas industry have such a fine story to tell—the story of national weal in coal conservation and the production of materials essential to industry; of communal well-being in solving the smoke problem; and of individual comfort and labour lightening. This is where advertising comes in. Even a Cabinet Minister is limited in his personal appeal; but through the medium of the Press, we can touch every home in the land, and appeal intelligently to many points of view.

Local Publicity.

The regular insertion of effective advertisements in local newspapers has at least three important results:

(1) It informs, interests, and influences consumers.
(2) It is a proof that the gas department really tries to look after its business, and is setting-up an ideal of service.
(3) If properly handled, it secures the goodwill of local editors.

There is no ulterior suggestion behind this last point. Newspaper people are like the rest of us. If treated in a fair, reasonable, and businesslike way they will reciprocate. As a general rule, they treat their customers as we try to treat ours. They wish *reliable* and *newsy* information; and if gas affairs are worth noticing, they will give them space. If proper relations

with the local Press are established, when nasty folk come along and want to make trouble editors will ring you up on the 'phone and ask for your side of the story. The proper cultivation of the Press is like the proper cultivation of any other business friendship, and is based on goodwill, fair dealing, and tact. If you want good reports of your speeches or visits (unless you happen to be a Cabinet Minister), prepare a summary to hand to the reporters.

I honestly wish you to think actively and intelligently on this matter, as it may possibly save some future "B.C.G.A." Manager a visit to your future Board or Committee to convince them of the value of your contribution to national publicity—a visit that will be quite unnecessary if you learn your job properly.

Competition.

Perhaps the best mental stimulant I could suggest for you to apply (it was recently suggested to me by a Past-President of the Institution) is to try to face the position of being responsible for earning and maintaining a maximum dividend, for retaining your output, or for increasing your sales, as the best argument for getting an increase in your salary—and all in face of active and growing competition.

Perhaps you are under the impression that it is futile and unnecessary to trouble about these matters, as the industry holds a monopoly for the supply of gas in certain carefully defined areas. This is a fairly common illusion. Gas, as gas, however, is not wanted by the consumer. It is light, heat, or power that the public need and are prepared to pay for; and in the supply of these services we have now to meet keen competition.

Here is an excellent list of our competitors compiled by a manager who quite recently was an active junior in the West Riding:

Light	Electricity	Very keen.
	Oil	Negligible.
	Candles	"
Heat	Coal	Exceedingly keen.
	Coke	Keen.
	Patent fuel	Fairly keen.
	Oil	" "
	Electricity	Unimportant.
Cooking	Coal	Very keen.
	Oil	Unimportant.
	Electricity	"
Power	Coal (steam)	Very keen.
	Electricity	" "
	Coke	" "
	Oil	" "

It will thus be seen that, far from having a monopoly, we have a hard fight to increase our output and reduce costs to the advantage of our consumers.

Competition is a fine stimulant. It is the spice that adds kick to the sluggard and zest to the fighter. It has been well said that: "If it weren't for your competitors, you would be as dead as the Post Office or any other monopoly. If it weren't for your competitors, there would be moss and ivy all over you and your business. If you had no competitors, life would be as flat and stale to you as it is to a clerk in the Board of Trade. There would be no contest, no race, no prizes, no sporting spirit of any kind. If you are not doing well, don't blame your competitors. Blame yourself; you are losing more money by neglect than you are by competition."

That the gas industry as a whole has continued to develop in the marvellous manner it has done, can only be accounted for by the new spirit and outlook which permeate it.

Education.

Advertising is a very real form of education, which means, according to Webster: "To inform and enlighten the understanding." We must seek out our public, who are usually not looking for us, and may either be quite happy without our service (or very dissatisfied with it) through lack of knowledge, or may be allured and captured by a newer and more persuasive and alert competitor. In all processes of education—whether by interview, public speaking, or lecture; correspondence, circular, booklet, or catalogue; advertising in "news" columns in journals; showcard, poster, window display, or exhibition; film or lantern lecture—the gas industry may profitably take a part.

The results accruing from advertising and good service do not come immediately. It was a wise old Scot who only sowed his bread on the water when he knew the tide was coming in. The wonder of modern publicity, however (and this is no extravagant claim), is that it has frequently turned the tide; and it is only when business comes with a flood that some people begin to wonder as to the hidden causes. There are some managers who, because of the ease with which business is coming to them to-day, do not recognize the forces that have been at work and are still in active operation, which are bringing about this happy state of affairs.

Mental Attitude.

I wonder what your mental attitude is to some of the positive claims recently made and officially published by the Association of British Advertising Agents, as for instance:

That advertising has developed into one of the most effective means of reducing selling costs and simplifying the processes of distribution.

That by advertising many business firms have assumed a position of national, and even of international, importance, while smaller concerns have rapidly been raised to the level of leading commercial houses.

The obvious value of advertising lies in the fact that it provides a direct and speedy channel of communication between seller and buyer, between producer and consumer, between the one that has the goods and the one that has the money.

That it affords a quick, cheap, and effective means of addressing the consumer and attracting his custom.

It can fix standards of quality and price; check profiteering; accelerate the formation of a trade connection; consolidate a goodwill; render a trade mark of more value than the grant of any letters patent; and help materially in raising men and money for a great war.

Your mental attitude to statements such as these may possibly be: "Well, obviously, these are the sort of things that people whose business it is to sell advertising would say. It pays to advertise advertising."

What then, of some other simply expressed statements by the Sales Manager of one of the best managed gas undertakings in the United Kingdom:

(1) Remember advertising is not a load on the purchaser; it is a factor resulting in benefit to the purchaser.

(2) If by publicity our customers are taught to use more gas with benefit to themselves, the effect on standing charges is immediate and continuous. Moreover, to increase the public demand for a useful product is a public benefaction. It is, therefore, our duty to make known our goods and the service we offer, in order to cheapen the supply to the public whom we serve with one of the necessities of modern civilization.

The ways in which gas can best serve the community include not only the invention, construction, manufacture and installation of the most economical gasfittings and appliances, but the instruction of the public in their economical operation and the continuous maintenance of them in efficient working order. That may be summed-up in the phrase "Supply *plus* Service," with the accent on "Service." The work of the "B.C.G.A." is to advertise and advocate gas service of the highest possible standard. The gas undertaking that is keen and alive to the needs of its constituents will gain most by the national expenditure.

Advertising is accepted to-day as a necessary part of business, and advertising costs as a necessary part of the expense of doing business.

Mr. Mason then gave details of the "B.C.G.A." advertising schemes with various interesting points relative to policy, costs, and "behind-the-scenes" work. He concluded his address on the personal note, pleading for higher ideals of general education, as well as for the high thinking that brings the truest success. He finished with a fine quotation from Dr. Joseph Parker's autobiography:

> If a man will work hard, and make the best of whatever talent he may have, he will, in the long run, be appreciated and honoured by his brethren. They are glad to recognize courage, pluck, and endurance; and their honest motto is: "The palm be his who wins it."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Travelling Showroom.

Sir,—It was with the greatest interest that I read the editorial and illustrated article in the issue of the "Gas Salesman" for March 28, regarding "The Travelling Showroom," by Mr. Bloor. The idea is excellent, and will supply a long-felt want of many gasworks, especially those whose districts are composed of a number of villages where a permanent showroom in each village is not a practicable proposition.

Many gas undertakings, of which Royston is one, supply a number of villages where the amount of business to be obtained would not justify the expense of taking a small hall and fitting up for demonstration purposes. The usual method of house-to-house visits by a canvasser lacks what is often the deciding factor—viz., that of seeing the actual appliance in use, and burning gas from the same mains. The bulk of the consumers in this area do not see our showroom from one year's end to another.

By means of a travelling showroom, demonstrations can be given on practically every consumer's doorstep; and this is undoubtedly a novel and effective method of dealing with small villages.

About three weeks ago, I suggested to Messrs. Radiation Ltd. that a travelling showroom would be of very great help in pushing the sale of up-to-date appliances; and I believe that this matter is now having their consideration. At that time I was not aware that the idea had already been put into practice.

I certainly wish to add my congratulations to Mr. Bloor and the York Gas Company on the initiative they have shown.

A. C. Taylor.

Royston (Yorks.) and District Gas Company, Ltd.,
Royston, near Barnsley,
April 4, 1928.

REGISTER OF PATENTS.

Purification.—No. 261,755.

KOPPERS COMPANY, of Pittsburgh (Assignees of F. W. Sperr, of Pittsburgh).

No. 29,040; Nov. 17, 1926. Convention date: Nov. 18, 1925.

This invention relates to a process and apparatus for the elimination of hydrogen sulphide and other impurities from fuel gases, and more particularly relates to such purification of gas by a cyclic process and apparatus which includes the use of ammonia together with a ferric or other metal compound, and also in which aeration or revivification of the fouled wash liquor takes place; the aerated liquor being returned for further absorption of hydrogen sulphide. In the prior processes no provision was made for the removal or fixation of the ammonia in the liquor prior to aeration. It is the object of this invention considerably to reduce the operation costs of a process of liquid gas purification of the type referred to, thereby rendering the same an economic commercial proposition.

The cycle of operations is as follows: Absorbing the hydrogen sulphide from the gas by means of ammonia and a wash liquor containing an iron or other metal compound as herein described; distilling the ammonia out of, or otherwise removing it from, the resultant sulphide liquid; recovering or fixing the said ammonia; then aerating the residue of the said liquid; and returning the aerated liquid for further absorption of hydrogen sulphide.

The invention includes other new and useful improvements. The description of the details of the various processes involved occupies over seven pages of print, and is of exceptional technical interest. There are five sheets of drawings.

Gas and Semi-Coke Production.—No. 285,664.

MOND, A. L., of Southampton Buildings, W.C. 2.

(A communication from the METALLBANK UND METALLURGISCHE A. G., of Frankfurt-am-Main.)

No. 7214; March 15, 1927.

This invention provides a continuous process of producing rich gas, semi-coke, and bye-products from bituminous fuel with the aid of oxygen or gases rich in oxygen, with or without steam, of the type wherein the fuel in the upper zone of the column is subjected to distillation by the sensible heat of the gas produced by gasification of the fuel in a lower zone. The process is characterized by the feature that the lower portion of the fuel column (consisting of degasified fuel derived from the upper portion) is divided into two parts, one of which is subjected to a gasification process by means of oxygen or air rich in oxygen in such a manner as to produce only the sensible heat required for the distillation, while the other portion is withdrawn in the form of a semi-coke without taking part in the gasification process.

In carrying out the process, it is advantageous to employ a generator similar to that used for gasification by means of air, and to introduce into the gasification zone only so much oxygen, per kilogram of fuel supplied, as is required for the development of heat for coking the fuel. The generator is modified in such a manner that part of the semi-coke produced in the upper zones of the gas generator is completely gasified by means of oxygen while the remainder is obtained as an easily combustible smokeless fuel of high value and poor in ash.

Preferably there is added to the oxygen supplied to the gasification zone so much steam (or in special cases carbon dioxide) as is required for the operation of the generator and for the desired gas formation. In order to increase the heat economy of the process, it is preferable to pass the additional steam first through the hot semi-coke, and only thereafter to admix the oxygen required for the gasification. In this manner the semi-coke can be obtained free from water by dispensing with the hitherto usual cooling by quenching with water.

Briquetting.—No. 286,336.

LESSING, R., High Holborn, W.C. 1.

No. 27,512; Nov. 3, 1926.

In the briquetting of coal, coke, ores, and other material, the binder most commonly employed is coal tar pitch. The patentee, however, points out that the use of pitch is attended by a number of drawbacks; it is a material difficult to grind to the requisite fineness, the ground pitch is liable to coalesce again on storage, the distribution of the ground pitch throughout the mass of material to be briquetted is comparatively uneven, the particles of pitch are liable to run when melted and to swell when heated to the temperature of decomposition, thus weakening the structure of the briquette, and finally the handling of pitch in powder form is objectionable on hygienic grounds, as it may cause pitch cancer in persons coming in contact with it. Moreover, coal tar pitch is a material subject to violent price fluctuations. The patentee claims to have found a method by which the advantages of pitch as a binder may be retained and enhanced, while the disadvantages enumerated above will be obviated.

The invention is particularly applicable to the treatment of material to be briquetted; but it is also applicable to road metal for coating it with pitch.

According to the invention, the material is coated with a fraction obtained from coal tar or similar product containing a pitch-like fraction and an oily fraction. Incorporation is carried out with or without the application of heat; and from the more or less granular paste thus produced the oily portion of the tar is extracted, so that the pitch contained in the tar is precipitated and forms a substantially homogeneous coating round the particles. In this extraction hydrocarbons of a non-aromatic character are used, such as distillates from petroleum, shale, or primary coal tar and the like, consisting mainly of hydrocarbons of the paraffin or naphthalene series. A small proportion of aromatic hydrocarbons may be present, but in this case the precipitation of the pitch or bitumen is not so complete.

The patentee has found that the removal of the tar oil from the mixture may be assisted by the addition of certain reagents. If, for instance, a small quantity of sulphuric acid is added to the tar-coated material and thoroughly blended with it, the mixture becomes more granular and free-running and less tacky than it was before the admixture of the acid; and in this condition it is more readily extracted than a mixture without the addition of acid.

Full details are given in the specification, and also an example of the application of the invention.

Regenerator Settings.—No. 286,418.

BROADHEAD, R. W., of Huddersfield.

No. 1324; Jan. 17, 1927.

The patentee claims: A regenerator setting for use in the manufacture of gas wherein the producer and the regenerator are arranged externally to the retort bench, and as a separate unit; one regenerator being arranged to serve a number of beds of retorts, waste gas being led away from the various beds of retorts by a suitable insulated duct or ducts to the external regenerator, and preheated producer gas and secondary air being led back by suitable insulated ducts to the several beds of retorts.

Gas Lighting Apparatus.—No. 286,473.

PARKINSON STOVE COMPANY, LTD., and GIBB, D. M., both of Stechford.

No. 7951; March 22, 1927.

This invention relates to gas lighting apparatus of the kind in which a plurality of pilot jets can be caused to extend in the form of tongues of flame, for the purpose of lighting an adjacent burner in a cooking stove or other form of apparatus.

The invention comprises the combination of a plurality of radially disposed nipples arranged around a cylindrical body at one end of a gas supply pipe, and a pair of enclosing parts providing an annular gap between them for the admission of air; one of the said parts being formed with apertures through which the flames can pass. Also the invention comprises the provision in the supply pipe of a cock of the conical plug type, which in either limit of movement admits but a small supply of gas to the nipples of the lighter, while in an intermediate position it admits a full supply.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 28.]

Nos. 8224—9010.

CHEMISCH-TECHNISCHE GES.—"Method of producing coke." No. 8309.
DAVIDSON, T. M.—"Distillation of carbonaceous substances." No. 8493.
DOLPHIN, J.—"Atmospheric gas burners." No. 8796.
FORSHAW, A.—"Gas ovens." No. 8341.
FREDERICKS, E.—"Gas cocks." No. 9001.
GARDINER, G.—"Manufacture of coal gas." No. 8281.
GARVEY, E. C.—See Fredericks, E. No. 9001.
GLOVER & CO., LTD., T.—"Valve mechanism for coin-feed gas meters." No. 8713.
GLOVER & CO., LTD., T.—"Union joint for piping." No. 8842.
HOOPER, L. D.—"Gas stoves, lamps, &c." No. 8536.
HOWLETT & CO., LTD., M.—See Dolphin, J. No. 8796.
HOYLE, D. G.—See Glover & Co., Ltd., T. No. 8713.
JANSEN, C. O.—"Burners for gas stoves." No. 8265.
KEITH, G.—"Thermostatically-operated valve devices." No. 8928.
KEITH & BLACKMAN COMPANY, LTD.—See Keith, G. No. 8928.
LITZ, W.—"Gas burners." No. 8595.
LYNDE, W. A. G.—See Fredericks, E. No. 9001.
MAIN, LTD., R. & A.—See Forshaw, A. No. 8341.
REES, E.—See Gardiner, G. No. 8281.
SMITH, E. W.—"Gas meters." No. 8346.
SMITH, F.—"Inverted incandescent gas burners." No. 8655.
SMITH METERS, LTD.—See Smith, E. W. No. 8346.
WILSON, J. H.—"Prepayment gas meters." No. 8687.
WORTLEY, G. W.—See Forshaw, A. No. 8341.
YATES, H. J.—See Dolphin, J. No. 8796.

New Companies.—Henry Ellison (Glasgow) is the title of a Company registered, with a nominal capital of £50,000, to carry on business as tar and ammonia distillers, &c. The Shirland Gas Company, Ltd., with a nominal capital of £15,000, are to take over the business carried on by the Shirland, Hallfield Gate, and Higham Gas Light and Coke Company, Ltd. (in liquidation). The Southern Tar Distillers, Ltd., of Aldwych House, W.C., have been registered as a private Company, with a nominal capital of £100. The Coal Research Syndicate, Ltd., of 16, St. Helens Place, E.C., have a nominal capital of £1000, and the Metropolitan Smokeless Fuel Company, Ltd., of the same address, a capital of £100.

MISCELLANEOUS NEWS.

CHESTERFIELD GAS EXTENSIONS.

On April 3, Mr. F. G. Hill, Government Inspector, conducted a public inquiry at Chesterfield, relative to the Town Council's application to the Ministry of Health for sanction to borrow £6000 for the purpose of providing a high-pressure steel gas main from the central gas-works through the Highfields Estate to the gas-works at Whittington Moor.

The TOWN CLERK (Major Parker Morris) said that the object was to provide adequate means for filling the holders at the Whittington Gas-Works without the necessity of using exhausters at night time, thus obviating the necessity for night labour. The Corporation desired also to improve the supply of gas in the Highfields district of Newbold, Whittington Moor, Old Whittington, and Brimington, and also to provide for future building developments in the area through which the main would pass.

Mr. R. H. BLAKER, who attended on behalf of the Chesterfield and District Property Owners' and Ratepayers' Association, expressed doubt whether the present was an opportune time for increasing the town's indebtedness, having regard to the fact that £2,500,000 had been already borrowed for municipal purposes. It was clear, he suggested, that the application which had been made in regard to these proposed new works would not effect any saving whatever.

The TOWN CLERK, in reply, said that considerable developments were expected in the areas concerned, and the Corporation had arrived at the point that they could not satisfactorily meet with their present mains any further demands. It was significant that in the last eight years the consumption of gas had increased from 265 million c.ft. to 450 millions. If they had adopted the policy of Mr. Blaker, and stood still, it was obvious what would have happened. Moreover, the prices charged for gas by Chesterfield were among the lowest among the municipalities in the country. They charged 8d. per therm for lighting, 7d. for heating and cooking, 6d. to 5d. for an industrial load, less 5 p.ct. reduction for prompt payment.

EMPLOYEE SUGGESTION SYSTEM.

In a contribution to the pages of the "American Gas Journal," Mr. Felix B. Streyckmans, of the People's Gaslight and Coke Company, Chicago, sets himself to prove that employee-turnover is costly, and should be kept down to the minimum; "turnover," in this case, being confined to the discharge of an employee who is replaced by someone from outside the organization. The monetary cost, he says, of replacing an employee in this way might be anything from $10 spent on "breaking-in" a new office boy to $10,000 or over required in "acclimatizing" an executive officer. The gas man rarely becomes stale in his job; he is more likely to grow seasoned in it. The author admits that the intangibility of increased vitality through changes in personnel is such that theories and opinions are probably the only bases for analyses; but he seizes upon the matter of securing new ideas from new employees as being a subject that is adaptable to tests and examples. Such tests and examples he is able to provide from the actual experiences of his own Company, who, since 1924, have been operating a comprehensive and highly successful suggestion system, having for its object to encourage ideas from the whole of their 4000 employees.

THE METHOD ADOPTED.

Suggestions for betterment of any phase of the Company's business in all departments by any employee are submitted to the Secretary of the Suggestion Committee anonymously on numbered blanks. The author of the idea is not known until after his suggestion has been finally ruled upon and the cash award announced. There are no restrictions on the nature of acceptable suggestions. All employees are given equal opportunity to take part; and all suggestions are judged with equal fairness. Because of the anonymity of the competitor, length of service or the nature of the employee's work can have no effect on the way in which the idea is considered or the value placed upon it.

RESULTS.

Since the system has been in operation about 5000 ideas have been submitted, 503 of which have been adopted and paid for in cash awards totalling $4370. The minimum award under the rules of the system is $5; and there is no maximum. With new ideas being submitted at the rate of four or five each working day, it is to be expected that the greater proportion of them will be of a minor nature. It is equally obvious that the greater number of awards will be in $5 amounts. Nine of the suggestions, however, were valued at from $50 to $200; and the eight authors received total awards of $1100. In other words, nine suggestions were made each of which on an average was worth fifteen times as much as the average of the others.

OLD AND NEW EMPLOYEES.

If the new employee is valuable because of his ideas, new employees would be well represented among the originators of the highly paid suggestions. But the opposite is true. The average length of service of these highly-paid competitors was twelve years. Only one was a comparative newcomer, with one year's service. The next youngest in service had nine years to his credit, and the others ranged from eleven to twenty-three years. The employee with the longest service—twenty-three years—originated the most valuable idea (the $200 one), and accounted for two of the nine exceptional suggestions, having merited a $50 award as well.

The circumstances are similar all through the list. The gas men who knew all the "whys and wherefores" are offering the worthwhile ideas on gas company betterment. The new employee is on the alert, willing, anxious, and active, but inadequately equipped, by lack of gas company knowledge, to make his ideas fit. Suggestions come from new employees on "better" ways of doing things which show that the originator had the wrong idea of why the thing is being done and what result is expected from it.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market has been very steady, with an improving tendency. Production is curtailed by the holidays, and all turns had been booked by the beginning of the week until after Easter. Demand has continued on a satisfactory scale, and quite a number of collieries are now well stemmed up to the end of the month. The better feeling of the last week or two has considerably improved the outlook, as merchants, who had sold short, are now in many instances trying to cover their requirements, thus further strengthening the hands of the collieries.

Actual business has been quiet in gas coals; but recent quotations are firmly held—16s. f.o.b. being asked for Wear Specials, 15s. 6d. for best qualities, and 13s. 6d. to 14s. for seconds. Coking has been quietly steady at 13s. 3d. to 13s. 9d. Best Durham bunkers are firm at about 14s. 9d. Northumberland steams hold to agreed minimum prices of 13s. 6d. downwards. The coke market is extremely quiet, and stocks fairly plentiful. Gas coke is quoted at 20s. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

The situation in the gas coal trade in Yorkshire and Lancashire is somewhat obscure. The business now coming forward is being booked in some instances at advances up to 2s. per ton, as compared with present-day obligations. The ultimate result of the Five Counties Marketing Scheme is very problematical; but during the present month there will be an opportunity of studying some of its features. It appears certain, however, that there will be a shortage of supplies so far as some descriptions of coal are concerned. This will probably lead to a readjustment of allocations and consequent working hours towards the end of the month.

Industrial coal of the better grades is rather firmer, with indications of appreciated value for future deliveries under contract. Some collieries are not inclined to quote very far ahead.

The export bureau is now in operation at Hull, and reports indicate that the shipments will be satisfactorily dealt with in this direction.

The domestic trade during the past week has been fairly satisfactory; but deliveries of the secondary qualities have been rather restricted by reason of the shorter working hours at many collieries through the operation of the Five Counties Scheme.

MIDLANDS.

There has not been enough business moving to test the effect of the Five Counties Scheme on prices. The market has pursued a humdrum course as heretofore without any indication that new forces have been brought into play.

The firmness previously noticed as regards slacks and smalls continues. Conditions have not become acute. Supplies generally are sufficient for the time being. If there is any tension, it is due to immobility in some parts of the area, and the effect on values is limited. Spot lots are not offered with the former freedom—in fact, they have ceased to be a factor of first importance. Outside slacks and small offers of odd lots of fuel for quick clearance are still made at something below the list prices of collieries.

Coalowners in the area who have definitely declined to join in the scheme are making known to the trade their freedom from output restrictions. Apart from this no special measures have been taken as far as appears to exploit the position. The first month's quota, 65 p.ct., is probably the equivalent roughly of the recent production.

Torquay and Paignton Gas Company.

Major R. P. Kitson (Chairman), presiding at the annual meeting of the Torquay and Paignton Gas Company, on Monday, March 26, referred to the increase of 30 million c.ft. in the sale of gas—making 535 millions for the year—as phenomenal, and said that, though the extended and increased prosperity of the Company rendered the stockholders' position more secure, it primarily reacted upon the consumer, who obtained a supply of gas at the cheapest possible price. The Directors recommended a further reduction in the price of gas by 2·4d. per 1000 c.ft. The balance-sheet showed receipts amounting to £152,782, and an expenditure of £132,848, as compared with £138,370 and £127,823 respectively in 1926. The balance carried to profit and loss account was £19,934, as against £10,547; and the Directors recommended that, after allowing for an interim dividend paid in October, the full year's dividend of 6 p.ct., less tax, be declared. The balance-sheet and Directors' recommendations were adopted.

Londonderry Gas Company.—At the annual meeting of the Company, Mr. R. H. Smyth (the Chairman) said that, during the year, 500 new consumers had been connected, and that 250 cooking stoves and over 100 fires had been sold. The undertaking continued to remain perfectly healthy—a condition of affairs mainly due to the good spirit which prevailed among the Directorate, management, staff, and employees.

TRADE NOTES.

Intermittent Vertical Plant for Oswestry.

Messrs. Gibbons Bros., Ltd., have received an order from the Oswestry Gas Company for a 30-ton per day intermittent vertical plant.

Rotary Air Compressors and Vacuum Pumps.

Messrs. Bernard Holland & Co., of 17, Victoria Street, S.W. 1, have published a new catalogue of their "Holland/S.L.M." air compressors and vacuum pumps, of which over 4000 are in daily use in many industries. If arranged with suitable piping and stop valves, the same machine can be operated either as a compressor or as a vacuum pump.

A £250 Reward.

It will be remembered that recently Messrs. W. G. Beaumont & Son offered £100 reward for the return of the eight measurement books, which have been missing from their office for some considerable time. As they are now realizing their value, in no small manner, Mr. Percy Beaumont has increased the reward to £250 for the return of the books, and is willing to pay £100 for definite information which will lead to their recovery. The firm have no alternative but to make another bid for them in case the finder has not realized that the reward is worth the find, or maybe the announcement offering the reward has not come to the notice of the finder.

CONTRACTS OPEN.

Coal.

The Gas Department of Dumfries invite tenders for the supply of coal. [See advert. on p. 131.]

Gasholder Removal.

The Gas Department of the Glasgow Corporation invite tenders for the removal of one or two gasholders. [See advert. on p. 131.]

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 10.

There is no change to report in the position of tar products, and prices remain the same as recorded last week.

Tar Products in the Provinces.

April 10.

The average prices of gas-works products during the week were: Gas-works tar, 46s. 6d. to 51s. 6d. Pitch—East Coast, 60s. to 65s. f.o.b. West Coast—Manchester, 57s. 6d. to 62s. 6d.; Liverpool, 60s. to 65s.; Clyde, 62s. 6d. to 67s. 6d. Toluole, naked, North, 1s. 3d. to 1s. 4d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 8½d. to 9½d. Heavy naphtha, North, 8½d. to 9½d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7½d. to 7¼d.; Scotland, 7¼d. to 7⅝d. Heavy oils, in bulk, North, 8½d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 3d. to 2s. 4d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

There is no change to report from the prices published last week.

Reduced Price at Ballymena.—Gas in Ballymena (Co. Antrim) is to be reduced to a flat rate for all purposes of 5s. 10d. per 1000 c.ft., from 6s. 3d. formerly charged for lighting and 5s. 10d. for heating. Consumers of 50,000 c.ft. and upwards per quarter are to be charged 5s. 7d. per 1000 c.ft., with the usual discount for prompt payment.

Reduction in Price at Sowerby Bridge.—The Sowerby Bridge Urban District Council Gas Committee have decided that as from April 1 the price charged to consumers shall be reduced by 6d. per 1000 c.ft., making the new charge 2s. 6d. per 1000 c.ft. within the Council's area and 3s. outside—the usual discounts remaining in operation.

Issue of Stock at Worthing.—The Directors of the Worthing Gas Light and Coke Company have authorized Messrs. A. & W. Richards to offer for sale by tender £25,000 5½ p.ct. irredeemable preference stock in the Company; the minimum price of issue being £95 per £100. Tenders should reach Messrs. Richards, 37, Walbrook, E.C. 4, not later than eleven o'clock on Tuesday, April 17.

Hong Kong and China Gas Company, Ltd.—The report of the Directors for the year ended Dec. 31, which will be submitted at the meeting on April 17 states that the quantity of gas sold at Hong Kong and Kowloon was 11,613,200 c.ft. and 7,757,100 c.ft. more respectively than in the previous year; being increases of 6·37 and 15·68 p.ct. General unrest in the Colony retarded further growth of the business. Considerable quantities of lamps and burners have been sold or hired during the year; and every effort is being made to enlarge the Company's business in gas for lighting, as well as for cooking. Out of the balance of net revenue, the Directors recommend the payment of a dividend at the rate of 10 p.ct. per annum, free of income-tax, less 5 p.ct. paid as an interim dividend on Oct. 13 last.

Coke Oven Accidents in the United States.

Accidents at coke ovens in the United States in 1926 resulted, according to a report of the United States Bureau of Mines, in higher fatality rates, in relation to the number of men employed, than are usually experienced by the coking industry. These increased accident rates were due mainly to a disastrous explosion of gas at a by-product plant in Indiana; but even without the fatalities and injuries resulting from this explosion, the accident rates for the industry were somewhat higher than in 1925. The returns from the operating companies showed that 23,115 men were employed at all plants, and indicated a volume of labour equal to 7,286,605 man-shifts. The number of men employed was 130 less than in the preceding year; but an average increase of five working days per man raised the aggregate number of man-shifts of labour performed to a point about 1 p.ct. more than in 1925. As compared with the half decade 1921 to 1925, the number of employees in 1926 represented an increase of 12 p.ct., and the man-shifts worked about 19 p.ct.

Reduction in the Price of Gas at Hastings.—From the current meter reading and collection the price of gas will be reduced by ½d. per therm, which is equal to 2·3d. per 1000 c.ft. The new price will be 10½d. per therm (4s. 0·3d. per 1000 c.ft.) *plus* the authorized addition in the extended area. A corresponding adjustment will be made in the charge to prepayment consumers.

Halifax Reserve Fund.—The Halifax Corporation Gas Committee have decided to build up a reserve fund out of revenue by contributing from profits not less than £17,750 per annum, as from the 31st ult. The first call on the fund will be to pay off the present debit on appropriation account, now standing at £70,000; and the reserve fund, after such debit has been paid off, is to be raised to £30,000.

Good Working at Barry.—Following an announcement by the Chairman (Councillor C. B. Griffiths) that the Barry gas and water undertaking was in a position to hand over the sum of £4000 to the local authority, the Barry Council, which met on April 3, decided not to increase the rates for the half-year. Mr. D. J. Boon congratulated the Chairman of the Committee and the staff of the undertaking on such an achievement.

Knaresborough Works Closed Down.—The Knaresborough Urban District Council Gas-Works were closed down on April 4; the undertaking having been purchased by the Harrogate Gas Company, along with the Pateley Bridge Gas-Works. The last charges at Knaresborough were made by Councillor B. Brown (the Chairman of the Knaresborough Gas Committee) and Mr. B. Crosland. The previous day at Spofforth the old supply system had been cut off, and the Harrogate Company's supply turned on.

Swiss Industries Fair.—Dyes, asphalt and tar products, and colours and lacquers are among the exhibits at the twelfth Swiss Industries Fair, which is being held in Basle from April 14 to 24. More than one thousand exhibitors, representing practically every branch of Swiss industry, are taking part; each separate industrial group being housed in a hall of its own in the new Fair buildings, erected at a cost of £500,000. Buyers from thirty different countries are attending the Fair, and a little army of business men from Europe and overseas are taking the chance of getting in touch with Swiss manufacturers in need of raw materials.

Barnard Castle Gas Company.—At the annual meeting of the Company, the Chairman (Col. H. C. Watson) said that the Directors' report showed a balance of £1640 available for dividend, and recommended dividends for the last half-year at 3¾ p.ct. on the original consolidated stock, and 2½ p.ct. on the new ordinary stock, making, with the interim dividend, 6 p.ct. and £4 5s. 8d. p.ct. on the year, less income-tax. These dividends were declared. The Directors were glad to have been able last September to reduce the price of gas by 9d. per 1000 c.ft., and to take off another 6d. as from April 1. Further reductions, it was hoped, would soon follow, together with a return to the discount system. The free overhauling of consumers' fittings had proved popular and effective. A subsequent extraordinary general meeting authorized the Directors to apply for an order under section 10 of the Gas Regulation Act to alter the proportion of debenture issue from "one-third" to "one-half" of the issued capital.

The Dewsbury Gas Committee have passed a resolution congratulating the Gas Manager (Mr. H. L. Bateman) on the very satisfactory results achieved by him.

The Clitheroe Corporation are proceeding with their gas-works re-organization scheme to an extent involving an expenditure of £30,000. A Ministry of Health Inspector recently held an inquiry into an application for £50,000 borrowing powers; and these have been granted.

The Blackburn Gas Committee have agreed to improvements suggested by the Gas Engineer, at a cost of £53,061, at the Greenbank Gas-Works; these being regarded as essential to maintain the efficiency of the works. They include the installation of four Lancashire boilers, a telpherage system, coke storage bunkers for water gas plant, and the erection of a new exhauster house and plant.

At a meeting of the Eggbuckland Parish Council on March 26, a letter was read from the Secretary of the Plymouth Gas Company stating that the Company were inviting estimates, and would then proceed to consider linking up the parish for the purpose of a gas supply. It was stated that such a step would be welcomed by the inhabitants, and that the District Council would raise no objection to gas cookers being installed in their houses.

STOCK MARKET REPORT.

ALTHOUGH the past week on the Stock Exchange was comparatively quiet, there were some good features. Prices were well maintained, and the future is regarded with optimism. Gilt-edged securities continued to make good progress, and, except in the larger Australian issues, it is becoming increasingly difficult to secure a 5 p.ct. yield. The Funding Loan advanced ⅛, and the 3½ Conversion and 5 p.ct. War Loans were up 1/16. Speculation continued in the low-priced Industrial shares, and Home Railway stocks revived; but investors have not yet realized the opportunities in the market. Tobaccos are again steadily improving, and more interest is being taken in Insurance shares. Rubbers, however, received a severe set-back on the Prime Minister's announcement that restriction is to end finally in November.

The Gas Market was bright and cheerful. Reports from the companies indicate that, in spite of the high temperature that prevailed during February, the sales of gas for the past quarter have in most cases exceeded those of the corresponding quarter last year. Support continues for Commercial ordinary stock, and several large parcels changed hands at 99. Dealers have very little stock of any company in hand; and it is evident that where quotations are low, it is owing to no stock being offered. The ordinary stock of the Primitiva Company was again in good demand, and there was a large number of transactions, but the quotation eased a little (3d.) compared with last week. Gas Light ordinary also dropped slightly to 18s. 4½d.-18s. 10½d. The Tottenham "A" and 5½ p.ct. preference stocks rose 2 and 3 points respectively.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 98⅛, Continental Union 28, European 8, 8¼, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 7½d., 18s. 8¼d., 18s. 9d., 3½ p.ct. maximum 63⅜, 64½, 4 p.ct. preference 78½, 3 p.ct. debenture 61½, Imperial Continental 153¾, Montevideo 93, Primitiva 23s. 1½d., 23s. 3d., 23s. 4½d., 23s. 6d., 23s. 7¼d., 23s. 9d., 23s. 10½d., 24s., 4 p.ct. debenture (1911) 75½, 76, South Metropolitan 104½, 105½, 105¾, Tottenham "B" 94. Supplementary prices, Metropolitan (of Melbourne) 9½, Reading 5 p.ct. 83½, Worthing 95.

On Tuesday, Alliance and Dublin 99⅜, Bombay 22s. 7½d., 22s. 10¼d., British 115, Commercial 98½, 99, European 8 7/16, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 7½d., 18s. 9d., 4 p.ct. preference 79½, 3 p.ct. debenture 60⅛, 61½, Primitiva 23s. 4½d., 23s. 6d., 23s. 7¼d., 23s. 9d., 23s. 10½d., 24s., South Metropolitan 105, 105½, 6½ p.ct. debenture 100⅛, 101, Tuscan 20s. Supplementary prices, Eastbourne 3½ p.ct. "B" 102, Leatherhead 5 p.ct. 102½, Wandsworth 5 p.ct. debenture 99, 99½.

On Wednesday, Bombay 22s. 6d., 22s. 7¼d., 23s. 4½d., Bristol 80½, Commercial 98¾, 99, 99½, 3 p.ct. debenture 59½, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 7½d., Imperial Continental 153½, Primitiva 23s. 1½d., 23s. 3d. 23s. 4½d., 23s. 6d., 23s. 9d., 24s., South Metropolitan 105, 105½, South Suburban 5 p.ct. 106, Tottenham "A" 114, 115, "B" 94, 94½, 95, 5½ p.ct. preference 99, Uxbridge 5 p.ct. preference 87, Wandsworth 4 p.ct. debenture 76½. Supplementary prices, Eastbourne 3½ p.ct. "B" 102½, Wandsworth 5 p.ct. debenture 99½.

On Thursday, Alliance and Dublin 98, Commercial 99, Continental Union 28⅛, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 7½d., 4 p.ct. preference 79½, Imperial Continental 154½, Primitiva 23s. 3d., 23s. 4½d., 23s. 6d., 23s. 7½d., 23s. 9d., 23s. 10½d., South Metropolitan 105¾, 6 p.ct. preference 112. Supplementary prices, Aldershot 5 p.ct. "A" 85, Wandsworth 5 p.ct. debenture 99½, 99½.

Lombard Street was not as usual so plentifully supplied with funds prior to the holidays, and had it not been for the disbursements of Government dividends the market would have been compelled to borrow from the Bank. Early in the day on Thursday borrowers paid 3¾ p.ct. for fresh loans; but the rate gradually rose until as much as 5 p.ct. was demanded. Old day-to-day loans were renewed generally at 3¾ p.ct. A slight decline of 3/9d. p.ct. was registered in the Treasury Bill rate, the average being £4 0s. 1·17d. p.ct. There was no change in discount rates, 4 p.ct. being the working rate for three months' bills.

Business in the Foreign Exchange Market was on a very small scale. The dollar-sterling remained steady at 4.88 29/32, Italian lire depreciated slightly to 92.42½, and Pesetas were also higher at 29.05, but otherwise there were no variations. French francs were quoted at an average of 124, and Belgas at 34.96.

Silver was inclined to cheapen on Chinese selling, and the price finished at 26½d. per oz. Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 5.	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb 9	5	5	Aldershot 5 p.c. max. C. .	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	69—72	..	..
1,551,868	,,	Sept. 29	7	7	Alliance & Dublin Ord. .	95—99	..	98—98⅜
374,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb. .	64—67	..	..
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c. . . .	109—112	..	..
300,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	22/—24/-	..	22/6—23/4½
170,000	10	Mar. 8	8½	8½	Bournemouth 5 p.c. . . .	12½—13½	..	..
500,050	10	,,	7	7	Do. B 7 p.c. . .	12—12½	..	..
375,000	10	,,	6	6	Do. Pref. 6 p.c. .	10½—11	..	..
50,000	Stk.	Jan. 12	3	3	Do. 3 p.c. Deb. .	56—59	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb. .	76—79	..	..
357,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	..
341,880	,,	,,	6/8/6⅔	6⅔	Do. 5 p.c. Con.	103—106	..	..
1,287,500	,,	Feb. 23	5	5	Bristol 5 p.c. max. . .	87—88a	..	..
855,000	,,	Mar. 22	8	7	British Ord.	112—115*	..	115
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref. . .	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb. .	93—96	..	..
100,000	10	Nov. 24	8	6	Cape Town, Ltd. . . .	8—9	..	..
100,000	10	Oct. 27	4½	4½	Do. 4½ p.c. Pref. . .	6⅛—7⅛	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb. . .	72—77	..	..
836,860	,,	Feb. 23	6	6	Cardiff Con. Ord. . . .	98—101	..	..
287,860	,,	Jan. 12	7⅛	7⅛	Do. 7½ p.c. Red. Deb. .	101—104	..	..
157,150	,,	Feb. 23	5	6½	Chester 5 p.c. Ord. . . .	86—91b	..	..
79,185	1	Oct. 13	1½/-	1½/-	Colombo Ltd. Ord. . . .	31/—33/-	..	..
24,495	1	,,	1/6⅔	1/6⅔	Do. 7 p.c. Pref. .	20/ —22/-	..	..
375,402	1	Oct. 13	1/9⅔	1/9⅔	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
2,073,280	Stk.	Feb. 23	5	7	Commercial Ord.	97—100	..	98½—99½
475,000	,,	Dec. 22	3	3	Do 3 p.c. Deb. . .	57—60	..	59½
800,000	,,	Sept. 29	11	11	Continental Union, Ltd. .	28—33	..	28—28⅛
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref. .	88—93	..	..
287,560	,,	Mar. 8	6⅔	7	Croydon sliding scale . .	105—108	..	..
403,100	,,	,,	5	5	Do. max. div. . . .	81—84	..	..
492,270	,,	Mar. 8	7	10	Derby Con.	110—115c	..	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—73c	..	..
209,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c. . .	76—79	..	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb. .	90—95	..	..
1,002,180	10	Mar. 22	14	16	European, Ltd.	8—9*	..	8—8 7/16
18,703,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/4½—18/10½f	— /1½	18/4½—18.9
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max. . .	63—65	..	63⅜—64½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	77—80	..	78½—79½
5,602,620	,,	Dec. 22	8	8	Do. 8 p.c. Con. Deb.	60—62	..	60½—61½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	99—101	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
82,500	,,	Mar. 8	6⅔	6⅔	Hastings & St L. 6 p.c. Conv	87—90	..	..
258,740	,,	,,	5⅔	6⅔	Do. 8½ p.c. Conv.	68—71	..	..
70,000	10	Oct. 13	†10	†10	Hongkong & China, Ltd. .	13½—14½	..	..
173,200	Stk.	Mar. 8	5	5	Hornsey Con. 8½ p.c. . .	78—81	..	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	151—155	..	153½—154½
223,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	..
235,242	,,	Mar. 8	7	7	Lea Bridge 6 p.c. Ord. . .	94—97	..	..
2,145,907	,,	Feb. 23	5½	6½	Liverpool 5 p.c. Ord. . .	87½—88½b	..	..
600,000	,,	Mar 22	7	7	Do. 7 p.c. Red. Pref.	101½—103½b *	..	..
165,786	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap. . .	108—111	..	..
75,000	5	Dec. 22	17	18	Malta & Mediterranean .	5½—6	..	..
541,920	Stk.	Nov. 24	17	15	Montevideo, Ltd. . . .	92—94	..	93
2,061,815	,,	Mar. 8	5	5	Newcastle & Gateshead Con.	16/3—16/9df	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref. .	66½—67½d	..	..
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb. .	66½—67½d	..	..
131,780	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 6 p.c. Con.	97—100	..	..
300,000	,,	Nov. 24	7	9	Oriental, Ltd.	116—121	..	..
188,120	,,	Dec. 22	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,500	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101—104	..	..
236,782	,,	,,	5	5	Do. 5 p.c. max.	77 - 80	..	..
2,334,464	1	—	—	—	Primitiva Ord.	23/—24/-	—/3	23/1½—24/-
247,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. . .	92—96	..	..
695,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	74—76	..	75½—76
423,183	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb. . .	74—76	..	..
150,000	10	Mar. 22	6	6	San Paulo 6 p.c. Pref. . .	8—8½*	..	..
125,000	50	Jan. 8	5	5	Do. 5 p.c. Red. Deb.	46—48	..	..
270,000	Stk.	Mar. 22	6	6	Sheffield A	100—102a*	..	..
419,968	,,	,,	6	6	Do. B	100—102a*	..	..
1,047,000	,,	,,	6	6	Do. C	100—102a*	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
5,899,895	Stk.	Feb. 23	5	7½	South Met. Ord.	104—106	..	104½—105¾
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	109—112	..	112
1,895,445	,,	Jan. 12	8	8	Do. 8 p.c. Deb. . .	59—62	..	..
784,000	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	100½—101
91,500	,,	Feb. 23	8½	8½	South Shields Con. . . .	110—112 d	..	..
1,943,795	,,	Feb. 23	6½	6½	South Suburban Ord. 5 p.c.	104—107	..	106
368,837	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Mar. 22	5	5	South'mpton Ord. 5 p.c. max	77—79*	..	..
121,275	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	72—75	..	..
250,000	,,	Mar. 8	7	7	Swansea 7 p.c. Red. Pref. .	100—103	..	..
200,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	..
120,000	,,	Feb. 22	7⅔	7⅔	Tottenham District A 5 p.c.	112—117	+2	114—115
882,275	,,	,,	6⅔	6⅔	Do. B 8½ p.c.	92—95	..	94—95
150,000	,,	,,	5⅔	5⅔	Do. 5½ p.c. Pref.	98—101	+3	99
181,255	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	74—77	..	..
258,251	,,	Mar. 8	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c. . . .	78—80d	..	..
289,004	,,	Mar. 8	6⅔	6 5/16	Do. 5 p.c. pref. .	87—90	..	..
88,330	,,	,,	5	5	Wandsworth, Wimbledon, and Epsom—	83—88	..	87
80,000	,,	Mar. 8	8½	8½	Wandsworth A 5 p.c. .	129—134	..	..
255,636	,,	,,	7	7	Do. B 8½ p.c. .	111—116	..	..
432,535	,,	,,	5/19/0	5/19/0	Do. C and New	98—103	..	..
352,000	,,	,,	6⅔	6⅔	Do. Wimbledon 5 p.c. .	106—111	..	..
98,000	,,	,,	7⅔	7⅔	Do. Epsom 5 p.c. . .	112—117	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref . . .	86—91	..	..
88,416	,,	Dec. 22	3	3	Do. 3 p.c. Deb. . . .	57—60	..	..
284,743	,,	,,	4	4	Do. 4 p.c. Deb. . . .	76—79	..	76½

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.